

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

MAR. 13, 1950



Some commercial airports that have
installed or ordered

L-M high intensity runway lighting

BIRMINGHAM • BOSTON • CHATTANOOGA • CHICAGO
JACKSON • KNOXVILLE • MADISON, WIS. • MILWAUKEE
MINNEAPOLIS-ST. PAUL • NASHVILLE • NEWARK
NEW YORK International • NEW YORK (LaGuardia)
OKLAHOMA CITY • PHILADELPHIA International
PHOENIX • RALEIGH-DURHAM • ST. JOSEPH, MO.
ST. LOUIS • SALT LAKE CITY • WINSTON-SALEM
WORCESTER • AMSTERDAM • BRUSSELS • CANTON
DUBLIN • HANKOW • IRAN (Mehrabad) • PANAMA CITY
PARIS (Orly) • RINNEANA • SHANGHAI

LINE MATERIAL lights more runways

*than do all other
high intensity runway lighting
systems combined*

As the pioneer in High Intensity Runway Lighting, L-M is the recognized leader, both in the quality of its equipment and in the number of major airports using this equipment. The units provide the very high intensity of 180,000 beam candlepower without glare to the pilot.

Not so spectacular but equally important is L-M Medium Intensity lighting for smaller airports and secondary runways and taxiways at large ports. These units may be purchased as part of L-M's complete airport lighting "package." This lighting is highly efficient, CAA approved, with complete control equipment, and costs as little as \$1 per foot of runway.

Also available: large and small rotating beacons, obstruction lights, control panels, and auxiliary equipment. Write for literature and full information on L-M's Airport Lighting Engineering. Ask the L-M Field Engineer or write Line Material, Airport Lighting Division, East Stroudsburg, Pennsylvania.



See L-M's new fixed focus high intensity runway unit? Ask the L-M Field Engineer for Bulletin 490501

LINE MATERIAL Airport Lightin

YOU CAN BE **SURE**... IF IT'S
Westinghouse



J-34 TURBOJETS power the Lockheed XF-90 penetration fighter

The critical sweeps assigned to this Air Force fighter take it far behind enemy lines. Such missions demand the maximum in fuel economy, performance and reliability of the aircraft's power plant.

To meet these requirements, Lockheed selected Westinghouse J-34 Turbojets. Their small form

and low weight... characteristics of Westinghouse swirl-flow design... make possible high performance fighters like the XF-90.

24000



Westinghouse
AVIATION
GAS TURBINES



Now DC-4 operators, too, can cut brake maintenance costs

THE AIRLINES that have switched their DC-4s to B. F. Goodrich brakes have made important progress in maintenance costs. TWA reports 50% material savings on its 500-hour brake maintenance after making the switch. Non-DC-4 operators can do the same!

The CA has approved B. F. Goodrich brakes for the DC-4. Following extensive tests by Caputo Airlines.

Simple design is the reason behind the low upkeep of B. F. Goodrich Expendable Taper brakes. Many of the parts and knifings found in other brakes are eliminated. A screwdriver and

wrench are the only tools needed for changing. Full cycle braking action and low pressure operation make for slower, more even wear. New, improved brake blocks that use no overtension use of all the lining. As a result, maintenance man-hours, flying time losses and replacement costs are all cut!

What's more, pilots report they like the "operational feel". This brake cannot lock or grab. It responds smoothly to constant pressure. It takes emergency overloads better.

The B. F. Goodrich brake also saves weight. It can be designed lighter for

a given amount of kinetic energy than any other brake.

Here are a few of the planes that are reaping these benefits of the BFG wheel and brake assembly: Boeing, C-124, C-130, C-135, C-140, C-141, C-142, C-143, C-144, C-145, C-146, C-147, C-148, C-149, C-150, C-151, C-152, C-153, C-154, C-155, C-156, C-157, C-158, C-159, C-160, C-161, C-162, C-163, C-164, C-165, C-166, C-167, C-168, C-169, C-170, C-171, C-172, C-173, C-174, C-175, C-176, C-177, C-178, C-179, C-180, C-181, C-182, C-183, C-184, C-185, C-186, C-187, C-188, C-189, C-190, C-191, C-192, C-193, C-194, C-195, C-196, C-197, C-198, C-199, C-200, C-201, C-202, C-203, C-204, C-205, C-206, C-207, C-208, C-209, C-210, C-211, C-212, C-213, C-214, C-215, C-216, C-217, C-218, C-219, C-220, C-221, C-222, C-223, C-224, C-225, C-226, C-227, C-228, C-229, C-230, C-231, C-232, C-233, C-234, C-235, C-236, C-237, C-238, C-239, C-240, C-241, C-242, C-243, C-244, C-245, C-246, C-247, C-248, C-249, C-250, C-251, C-252, C-253, C-254, C-255, C-256, C-257, C-258, C-259, C-260, C-261, C-262, C-263, 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C-1856, C-1

DOMESTIC

NWA Mach 2-02 cruised into a runway outside Minneapolis Airport while attempting an instrument landing during a blizzard. Early reports indicated all 100 passengers and crew of the three were killed, two members of the house killed and three critically injured.

First commercial use of jet engine pod installations under study of Boeing Aircraft Co. for the Stratocruiser is expected to increase cruising speed of the big airplane almost 48 mph, get increased use of climb and make it possible to carry heavier gross weight for which the aircraft is already stressed. One Boeing jet concept uses one of two Westinghouse J-34 turbojets slung on pods at wingtips. This engine is rated up to 3400 thrust lbs and would give the Stratocruiser a total of 6800 thrust lbs in addition to power from its four Wasp Major reciprocating engines.

The studies have been shown to represent of airlines using the Stratocruiser, with special reference to the trans-Atlantic routes, and have reportedly been well received in a preliminary stage. It is estimated that the new version would carry enough higher gross weight to carry extra load for the jets as well as possibly additional weight for cargo or passengers.

General and Saul Glasser L. Martin DB-51, three-jet-powered ground support bomber built for USAF, is undergoing ground tests. First test has been made, eight test four months after flight tests of second test will go to Air National Command for service evaluation.

Personal and suitcase plane shipments in January totaled 151 by regular companies. Personal Aircraft Company of America's January report. It included among the two-to-five-place craft: 100 of first place at more than 44 mph cruise, total dollar value was \$344,000 against \$520,000 for 1952 shipments the previous month.

Vice Adm. John W. Reeves, Jr., Naval Air training chief, will be retired for age May 1, then needed to arrive duty to head as chief of Naval Airplane Control's office.

Bell Aircraft Corp. Buffalo, N.Y. decided to transfer its Prime Mover operation to an independent company. The Prime Mover Co. has been formed at Muscatine, Iowa, to manufacture and distribute the product. Bell is continuing to accept orders and make deliveries from its own plant, and will participate in the new company for at least 15 years.

United Air Lines expects to take

delivery May 31 on the last of five DC-10 ordered last August. All the new planes should be in hand by the end of June.

A Kansas Air National Guard Thunderbolt flew the 252 miles from Annapolis, Md., to Oklahoma City, Okla., in 19 min. at an average of 712 mph. Pilot was Capt. Ross Deibel of the 127th Fighter Squadron at Wichita, Kan. Republic Aviation Corp., which made the plane, said a "badly misused" engine.

Henry Ray Taylor, ST, senior vice president and flight safety expert, died at San Francisco of a heart ailment. He had been CAA safety agent at San Francisco Airport.

FINANCIAL

Ryan Aeronautical Co. earnings for the 1949 fiscal year ended Oct. 31 were \$153,052, equivalent to 91 cents per share on retreating share, compared with \$356,025, or 90 cents per share, the preceding year. Gross income in 1949 was \$1,014,336, of which the airplane division accounted for \$5,735,521 and Metal Products division \$6,777,745.

Westinghouse Electric Corp. reported 1949 net income of \$67,365,853. The amount, larger year's net in company history, equaled 1949's share on retreating share, compared with 1948 net income of \$51,658,351, or \$411 a share on common stock. In its annual report, the company disclosed that 1949 jet engine production was 30 percent above 1948.

INTERNATIONAL

Pierre de Bréville, affiliate of Pan American World Airways, is seriously considering purchase of de Havilland Caravelle for use in Brazil. Paulo Sérgio, president of the line, sent to England at de Havilland Aviation for the Turbojet-powered Caravelle's first test flight in February.

Luca Ampeghini Venturini, government-owned Venetian, operator, has received a license to enter permit from the Civil Aeronautics Board to fly between Mosquito (Guinea), Venezuela, and Montreal, Canada, via Havana and New York for four years. The rights are identical with those given LAV in 1946. LAV recently was given the aviation safety award for 1949 by the International Aviation Safety Council.

Buenos Aires, Spain, will be granted a Moroccan permit to start commercial flight service between Madrid and Mexico City.

Mobilization Planning—A Staff Report

Air Force industrial mobilization planning staffed by so-called "mobilizers" in two recovery posts is falling farther and farther behind its long-range schedule.

Typical of preparation cutbacks recounted by Defense Department budget cuts in a recent statement by Maj. Gen. D. K. Cook, AMC director of procurement and industrial planning, that it has been necessary because of methods to stretch 16 out of an original 55 manufacturers' method projects previously allotted for investigation by USAF funds in 1950.

Overall industrial planning budget for 1950 for the Air Force was cut approximately from \$16.9 million originally requested in the Truman budget, to \$15 million, and the 1951 budget has been further reduced to \$14 million.

Manufacturing methods studies have proved one of the most profitable forms of industrial planning, since they result in designing and developing of new high volume tooling and production methods, improved basic manufacturing techniques and new types of protective equipment and processes, aimed at large savings of man-hours and increased production volume for almost industrial mobilization.

Purchasing the necessary engineering and technical services to develop this improved volume production capability, especially important in the case of aircraft components, whose manufacturers cannot afford to develop tech. troops themselves with the low volume orders for components currently provided.

Available for industrial preparation accounts for 1951 under President Truman's budget will be \$10.5 million, as compared to \$13 million originally allotted for fiscal 1950, a reduction of approximately 20 percent in the face of the rapid increasing expenses of Russian aerospace. (The \$13 million was later reduced to \$10.6 million for 1950 by order of Secretary Johnson.)

Industrial preparedness measures for 1951 break down into seven categories:

- Mobilization preparedness, \$1,247,087
- Liaison/contract contracts, \$2,005,994
- Subcontract preparedness contracts, \$370,000
- Basic studies, \$100,000
- Manufacturing methods, \$1,054,000
- Materials planning, \$525,800
- Air Force contribution to Joint Armed Services Mobilization Agency, \$81,649

Example of the planning that is being done under these contracts is the case of the Pratt & Whitney R-3500 engine which currently powers the Convair B-56 and Boeing B-50 bombers, and F-100, C-119 and Douglas C-124 transport planes. After the prime contractor, Pratt & Whitney, is sufficiently developed, it is expected to contract out licensee-licensor contracts with the automobile companies who have accepted license to produce the engine in various Ford, Nash and Buick. The license and license companies then offer subcontractors and vendors, suppliers of valves, bearings, pistons, and components, etc., who will be asked to plan their contributions in a wartime level of production of this engine. Similar contracts cover such modification items as:

- Wright R-1300 engine for the T-28 North American trainer
- Wright R-1300 engine for the T-28 North American trainer

- GE J-47 and Allison J-35 engines.
- Curtiss and Hamilton Standard propellers for the B-50 and C-119.
- Radio and radio equipment.
- Fire-control systems.
- Bombing system components.
- Turbo-superchargers.
- Airframes of North American F-86, Republic F-84, Boeing B-47 and Boeing B-50, where licensing permits unusual problems.

Virtual in the overall planning in the materials program today is the need for increasing critical materials such as cobalt and columbium and developing substitutes for them. It also develops plastics and increasing use in aircraft and machine for magnesium, stainless steel and other more plentiful materials.

The basic studies made by industrial researchers under other contracts estimate and project the industry potential and determine the lead and amount of resources required to support such a potential. They develop these estimates and projections through fact gathering followed by analyses and interpretations.

Of the \$14-million total asked for 1951, commitments of four reserve Air Force plants equaled \$1,654,000. Plans are at Dayton, Missouri, Co., Cleveland Municipal Airport and Lockheed, Okla. Twenty-five other Air Force-owned plants not under lease to commercial enterprises are also available in emergency for Air Force production within 60 days, but are authorized by the lesser companies.

One of the \$14 million also covers \$505,800 for maintenance and conversion provision on the reserve at 30,287 machine tools, 15,487 related production equipment items, 7714 electronic instrument, and 5598 hand tools and proper held for use in control of industrial mobilization. (It has been reported recently that many of these machine tools are not in readiness. (Aviation Week, Jan. 30) because no delivery plans have been reported or even ordered, and that it would take a delay of almost a year before they could be put into operation, when the workmen were retrained.)

Brig. Gen. A. K. Kessler, Jr., USAF staff director of procurement and industrial planning, recently announced to Congress that nearly 30 percent of the total 1951 industrial planning budget was for salaries and travel expenses of Defense Department personnel. Gen. Kessler said that out of the \$14-million total budget, \$1,117,700 went for salaries and \$95,200 for travel expenses.

Kessler emphasized the importance of high grade planning personnel and continuity of personnel in the planning work, and the need for them to travel to confer with aircraft industry leaders at their plants.

He also emphasized the importance of the overall program in shortening the time required in an emergency for "our production machinery to reach high levels."

"With these funds," Kessler, "we are learning time." But Gen. Kessler's annual testimony to Congress that the amounts paid from the industrial planning budgets, large permitting was but relatively small in dollars compared to other defense budget items, would have brought more time, if they had been utilized.

Perhaps in the long-range planning schedule, they could by enough more time to make the derivative difference between victory and defeat.



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AVIATION CALENDAR

- Mar. 14—Engine Technical Committee: Propeller Technical Committee regular meeting, Aeronautics Industries Division, Washington, D. C.
- Mar. 15-16-17—National Aeronautics Standards Committee, Hotel Commodore, Washington, D. C.
- Mar. 16-17—Annual night propeller meeting, sponsored by the Institute of the Aeronautical Sciences, Center Hotel, Cleveland.
- Mar. 22-23—American Society for Testing Materials Committee D14, spring meeting, 2016 Rye St., Philadelphia.
- Mar. 26-31—National Flight Exposition, sponsored by Society of the Aircraft Industry, Navy Post, Chicago.
- Mar. 30-31—Southwest Interagency forum, sponsored by the American Helicopter Society and the Institute of the Aeronautical Sciences, New Franklin Hotel, Cleveland.
- Mar. 31—Quarter New York Safety Council conference on air travel safety, Hotel Statler, New York, N. Y.
- Apr. 14—Engineering and Maintenance conference, Air Transport Assn., Hotel Cawston, Reno City.
- Apr. 14—National Propeller Exposition, sponsored by the Chicago Propeller Co., 2415 Cassin Avenue, Chicago.
- Apr. 16-17—National Aeronautics Standards Committee: vehicle design meeting, Jetcraft Industries Aeronautics, Los Angeles, Calif.
- Apr. 18-19—Annual conference, American Society of Life Sciences Engineers, Hotel Statler, Detroit.
- Apr. 19—American Society of Mechanical Engineers, Aviation and Gas Turbine Division, Hotel Statler, Washington, D. C.
- Apr. 19-20—Annual business meeting, Assn. of Air Transport Executives, National Hotel, Columbia, Ohio.
- Apr. 19-20-1919 anniversary meeting, Society of Automotive Engineers, Hotel Statler, New York City.
- Apr. 24-25—Aircraft Engineers Council, dead animal meeting, Hotel Commodore, Cleveland.
- Apr. 25—Wings and wheels clinic sponsored by General Aviation Academy Co., Hotel Statler, Buffalo.
- Apr. 29-30—Fifth annual conference on stress and corrosion, Jacksonville, Fla.
- May 1-4-1919 National Aeronautics Standards Committee national meeting, Aeronautics Division office, Los Angeles, Calif.
- May 15-16—Midwestern conference on fluid dynamics and the national meeting of the American Physical Society, dead animal division, University of Illinois, Urbana.
- May 18-20—Annual Meeting of Woman's National Aeronautics Assn., Tulsa, Okla.
- May 19-20—Security annual personnel meeting, sponsored by Institute of Aeronautical Sciences, Lerner Hotel, Wichita, Kan.

FIGURE CREDITS

- 13—O'Brien S. Smith Co.; 14—USAF; 15—SACIA; 17—Boeing; 18—Boeing; 19—Boeing; 20—Boeing; 21—Boeing; 22—Boeing; 23—Boeing; 24—Boeing; 25—Boeing; 26—Boeing; 27—Boeing; 28—Boeing; 29—Boeing; 30—Boeing; 31—Boeing; 32—Boeing; 33—Boeing; 34—Boeing; 35—Boeing; 36—Boeing; 37—Boeing; 38—Boeing; 39—Boeing; 40—Boeing; 41—Boeing; 42—Boeing; 43—Boeing; 44—Boeing; 45—Boeing; 46—Boeing; 47—Boeing; 48—Boeing; 49—Boeing; 50—Boeing; 51—Boeing; 52—Boeing; 53—Boeing; 54—Boeing; 55—Boeing; 56—Boeing; 57—Boeing; 58—Boeing; 59—Boeing; 60—Boeing; 61—Boeing; 62—Boeing; 63—Boeing; 64—Boeing; 65—Boeing; 66—Boeing; 67—Boeing; 68—Boeing; 69—Boeing; 70—Boeing; 71—Boeing; 72—Boeing; 73—Boeing; 74—Boeing; 75—Boeing; 76—Boeing; 77—Boeing; 78—Boeing; 79—Boeing; 80—Boeing; 81—Boeing; 82—Boeing; 83—Boeing; 84—Boeing; 85—Boeing; 86—Boeing; 87—Boeing; 88—Boeing; 89—Boeing; 90—Boeing; 91—Boeing; 92—Boeing; 93—Boeing; 94—Boeing; 95—Boeing; 96—Boeing; 97—Boeing; 98—Boeing; 99—Boeing; 100—Boeing.

WHO'S WHERE

Changes

- **Walter W. D. Strohman**, former president of Strohman Associates, aviation public relations and advertising firm, has been named vice president in the merger of his company with Don-Peters, Inc., New York.
- **New Appointments—Mechanical Chemical Corp.** appointed Stanley De J. Gibson vice president and treasurer. His wife, Ingrid, is in charge of foreign sales. **Sam Rye**, senior engineer with Northwestern Services, CALHESSE, Kansas, joined Appoint Industries, Inc., to take charge of technical assistance in the Gulf Coast. **William A. Scott**, General Corp., Canada, N. J., made **Charles A. Bennett** chief engineer. **W. A. Bennett** was formerly with Remco, Inc., and is now with Remco, Inc. He was with Remco for 13 years, and was service manager for Feltz Appliances Co. **Aspenwood** division of General Motors named **R. C. Tinsley** and **T. P. Williams** assistant chief engineers. Tinsley was chief design engineer and a former head of Air Motors Company's propulsion technology. Williams was chief design engineer and a former head of Air Motors Company's propulsion technology. Williams was chief design engineer and a former head of Air Motors Company's propulsion technology.

Elections and Honors

- Gil E. Wilson**, aviation columnist of the New York Herald Tribune, has been designated Republican candidate for U. S. Representative in New York's 12th Congressional District. **Walter A. Strohman**, former president of Strohman Associates, Inc., was elected to the position of vice president of the American Society of Mechanical Engineers. **Walter A. Strohman**, former president of Strohman Associates, Inc., was elected to the position of vice president of the American Society of Mechanical Engineers.

INDUSTRY OBSERVER

- **French Navy** current **Dixie** (type) was shifted to lower Norddeutscher Lloyd, causing a capacity flight deck load on German FRF and Vought F4U fighters in the first physical performance of the U. S. Navy under the current defense transfer program of the North Atlantic Treaty Organization. The ship was then moved to the Navy base, and moved to the Navy base for the delivery. **Clara** also is a U. S. 8-deck ship, originally supplied to the British under Lend-Lease and transferred to the French in April 1945.
- **New 75-ton Skyrover** submersible also developed by Odeton Development and now said to be government in test all the conventional and aircraft weapons, and is expected to be succeeded by guided torpedoes. The **Skymover** Skyrover has an integrated radio direction control system and VT (hull) assemblies, and tests have indicated it is capable of detecting and being placed at extreme altitudes and at extreme speeds in day or night operations. Study now under way to combine USAF's Boeing GAFA vehicle project with a similar Odeton vehicle project is expected to provide assistance to Skyrover.
- **Redesignation of the D version** of the North American F-86 swept wing fighter in the F-85A, is anticipated by the redesignation of the plane in "X-85A" instead of all-purpose fighter. Modifications on the F-85A from the F-86 standard fighter version (AVIATION WEEK, Jan. 22) included lowering nose inlet door to provide space for shock waves in the nose, and addition of an afterburner for the GE J-47 turbojet, normally rated at 5200 lb. thrust.
- **Continued order from USAF** on **Republic F-84E Thunderbolt** fighters because of 1954 F-84E engine problems, placed both with the Lockheed Operation Thunderbolt on request in which many of the planes were to have been used. **Albion** reported incident was based on engine problems resulting from bearing difficulties. Investigation of the bearing lubrication system was started and engineering recommendations were made to USAF to rectify the trouble.
- **USAF** has set annual period at 225 in for the Pratt & Whitney R-1610 Wing Major engine actually used on operational B-36 bombers, with conventional bombers, with conventional bomber. **Boeing** has set annual period at 225 in for the Pratt & Whitney R-1610 Wing Major engine actually used on operational B-36 bombers, with conventional bombers, with conventional bomber.
- **VASP** Airlines, Brazil, purchased six **Su-26** fighters from the Soviet Union for \$1.5 million. The planes are to be used for training and for the transport of cargo. The planes are to be used for training and for the transport of cargo.
- **Kennedy City** gas turbine plant of **Westinghouse Electric Corp.**, which began operations in January, is assembling jet engines from parts shipped in from Pittsburgh and from subcontractors, but will soon start fabrication of jet engine parts also. **Westinghouse** jet engine output was 10 percent greater in 1949 than in 1948, and considerable additional increase is expected in 1950 as a result of new Kansas City facility.
- **Navy** has announced a new titanium alloy, including among other properties the least light weight metal, 1 percent titanium and 3 percent aluminum. As previously reported in AVIATION WEEK, primary use for titanium alloy are in gas turbine blades, turbine casings, engine casings, and other jet engine applications, because of the advantages of the high strength-to-weight ratio, high corrosion resistance and ability to retain its base properties at high temperatures. Its use in engines, Navy claims its base properties are not only greater engine power, but improved range, payload and maneuverability because of lighter weight. The material also has the advantage of being suitable in use in large quantities in the U. S. and Canada, thus becoming non-critical and non-strategic wherever it is produced in quantity.

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AVIATION WEEK

March 13, 1955



NEWEST TRANSPORT scheduled for widespread domestic use is the Martin 4-O-4 which looks like the 3-O-2, but with a longer nose.

Eastern and TWA Order 65 Martin 4-O-4s

By Alexander McBarney

Two major airlines, Eastern and TWA, last week agreed to buy a \$35-million package containing 65 Martin 4-O-4 transport planes—35 for Eastern and 30 for TWA.

Details of financing were receipt that arrangements reportedly were being made whereby RFC was to supply most of the capital through the Martin Co. Both TWA and EAL were said to be ready to get back orders if needed in preparation for down payments and further payments as planes are delivered.

Collaboration of the largest U. S. two-engine transport and its three years followed months of engineering negotiation between the two airlines and the Glenn L. Martin Co. First reported in Aviation Week (Dec. 29) which reported in probability the most complete agreement on details of a new transport ever reached by two airlines.

► **Lease Deal**—Accompanying the purchase transaction for the projected 40-4s is a leasing arrangement (Aviation Week March 6) between TWA and Martin for 12 nearly-completed 36-passenger Martin 2-O-2 non-pressurized transports, possession of the 43 passenger 4-O-4s.

Delivery of the 4-O-4s is scheduled to start in the spring of 1955. Eastern's new engines will be certified by CAA at 41,000 lb gross while TWA's planes are expected to weigh in at a gross of around 42,750 lb each.

► **Higher Gross**—The Martin company is starting immediately to get its remaining 26-4s also anticipated at the 41,000 lb. gross weight, instead of the original 39,500 lb. figure for which they were originally designed, so that they can be loaded to TWA's 41,000 lb. weight. First of the leased planes is expected to be ready for TWA by the middle of the summer and all 12 by early fall. The extra weight allowance will be used for fuel or cargo since the wing plan is not expected to be altered.

Announcement confirming the transaction for the 4-O-4s came last week directly from Capt. E. V. Rodenbush, Eastern president, and Ralph S. Dawson, Trans World Airline president. C. C. Thomas, president of the Martin Co., is credited personally with much of the success of the deal since after a hard-fought battle between Martin and Convair.

► **Reverse Poop**—Powerplants for the 4-O-4s will be two latest type Pratt & Whitney R3500-G8-16 engines each

delivering 2160 hp, with water injection, and having Hamilton Standard reversible pitch and automatic feathering propellers. Eastern is reported to have made a special engineering study of reversible propellers and some recent technical difficulties with them before accepting the feature, which enables the airplane to weigh in at a higher gross.

Announcement described the 4-O-4 as "the first production airliner designed for conversion to jet-engine drive propellers," a statement which will presumably be spread by Convair, which has previously stated that its Convair 440 was originally designed for turbo-prop conversion. (See accompanying story for additional details on late turbo-prop transport developments.)

► **Longer Fuselage**—The 4-O-4 is expected to pass its certification tests with relative ease since it is basically a slightly larger version of the already proven Martin 2-O-2, with 79-in. longer fuselage to accommodate an extra row of four seats. Northwest Airlines has been operating 24 of the 3-O-2s for the last two years, attributing no significant dependability record after the first difficulties almost universally accompanying a new transport's introduction in service were solved.

To the Glenn L. Martin Co. the new contract came as a welcome substantial addition to relatively small military aircraft contracts, now correctly for steady production. Other Martin business vehicles is special weapons program, electronic military transport and electronic fire-control system, a subsonic training program for military aircraft, structural reconstruction and some research and development contracts.

► **Mass Sales—**How and that the program spread over the next two years would be "important to the company's ability and readiness to accept further work from use at all of its divisions. We are confident that the Martin 44-4's many points of assembly will be of great interest to other airlines which still have not replaced their older twin-engine transport equipment and will result in further orders."

Price of around \$540,000 apiece for the 40-4's will generate orders that not give the Martin company a large profit, industry experts point out, and the company may be able to come out even on the transaction if additional airline purchases are not forthcoming. Patton, and Glenn Martin, now in some retirement, and the RFC officials who have an interest in the Martin company, are anticipating that the low price for the proposed craft will attract additional business from other companies, and probably from on from both Eastern and TWA, in their own additional twin-engine equipment replacement.

► **Source of Pratt—**Patton pointed out that acceptance of the proposal by "two of the most experienced and most highly regarded airlines in the world" was in itself a source of pride to his company.

► **Performance—**The new 40-4 is expected to be slightly improved over the 40-3 in speed, with a maximum of 323 mph at cruising altitude (14,000 ft) and a probable near 300 mph cruising speed.

The Martin 203 quotes an "exceptionally low stalling speed at a gross weight, certified at 70,000 lb at CG. Presumably the new plane will have only slightly higher stalling speed due to the increased gross weight. This will allow the aircraft to operate in a wider safety margin field, as in DC-3 replacement. It is understood that the advantage in short field performance was one of the factors in selection of the Martin over the Convair.

► **Pratt Engines—**The Pratt Martin equipment deal by Eastern and TWA is an interesting indication of continued standardization by the two airlines, following their previous choice of the Pratt and Whitney engines for all low-engine aircraft. As of Jan. 1, TWA had 15 Constellation with additional 30 on order, while Eastern had 20 Constellation. At the same date

Eastern was operating 51 Douglas DC-3's while TWA was operating 61 of the same type, giving some indication of a large eventual twin-engine replacement market potential for these two airlines with the 40-4 than the original order alone.

► **Other Airlines—**Pratt DC-3 replacement market among other U. S. airlines for 40-4's may include such companies as United, Eastern, Chicago & Southern, Colonial, Delta and National, while Northwest might be interested in increasing the gross weight of its present 203 planes and possibly

augmenting this fleet with additional Martin planes at some later time. American, Continental, Mid-Continent, Northwest and Western all currently operating Convair Lears, are likely prospects to buy 40-4's, now in Canada, which has ordered three Super DC-8's, the first installment to a larger order yet to come.

It is also likely that other airlines may show interest in a leasing or purchase of the 12 new 203's after TWA completes its order of them under leasing arrangement and turns them back for 40-4's.



BOEING TURBOPROP 203, Boeing's new version of

Turboprop Transport Plans Jelling

Plane manufacturers are working on conversion of their present equipment to turboprop installations.

Prospects for development of U. S. turbopropeller transports seemed up but work in more manufacturers made both for augmentation of their design by potential military and airline customers.

Behind all the prospects and surface and military considerations of these new planes was an overall engineering head of wonderful waiting to see how the only turboprop engine now being in this country, Allison's new T-56 shaft-hub turbine, made out in extended flight tests.

First flights of the double version (5900 hp) of the T-56, the Allison T-56, in a four-engine installation in the Convair Navy XP-47 flying boat, were expected "any day now" at San Diego.

Then and the last flights in the Allison-convair Constellation, now being modified to receive two T-56 installations as a flying boat test, will answer more engineering questions about the turbine and military customers were to know, before they commit any extensive turboprop programs to production.

Meanwhile several manufacturers had

work indicated their turboprop transport designs are still in the early development when more experience is available on the engine.

Reports were:

► **Boeing Airplane Co.** announced that installations of four Allison T-56 turboprop engines are being developed as potential replacements for the four conventional Pratt & Whitney R-4160 Wing Major engines governing the Boeing Stearman and its military counterpart, the C-97A Superfortress.

► **Glenn L. Martin Co.** disclosed that the new 40-4 twin-engine transport which it will build for Eastern Airlines and TWA (see accompanying story in *Headline News* section) is designed for conversion to turboprop installations using the same Allison T-56 single turbine units which are being installed in the new Constellation in the new 40-4, Convair-Lear.

► **Douglas Aircraft Co.** has made studies of application of turboprop powerplants both in the DC-8 and DC-8B with the T-56

single turbine units. Also under consideration is a turboprop version of the big C-124 military transport, which would use the double-turbine T-40 units.

► **Consolidated-Vulcan** started work at San Diego on modification of the AD-5A Convair-Lear flying test bed and converted into two tests of what will presumably be the first turboprop installation to fly in the U. S., the Navy XP-47 flying boat, which is being modified to accommodate the double-turbine Allison T-56. The Navy engineers discussed with the USAF design for a turboprop version of the B-36 intercontinental bomber with swept wings designed for 380 mph speed. (See story starting on page 14.)

Frederick R. Collins, Boeing vice president and chief engineer, is announcing the turboprop possibilities version of the Stearman and Superfortress and overall weight would be approximately 25 percent less than for the present piston engine installations which would enable the plane to carry

1600 gal additional of fuel, or its weight equivalent of 1000 lb. He estimated that modification of the Stearman's main lines to take the smaller diameter double-turbine unit would be the same regardless of the engine, since it was already highly stressed and designed for high speed operation. However all difficult changes lengthening fuselage would be recommended to increase gross volume or passenger capacity. In such a version, Collins estimated the double-turbine Stearman would "give fourfold aircraft power for the next decade at least."

Martin's design study for conversion of the 40-4 to turboprop power, with the Allison T-56 unit, presumably was based partly on the propulsive conversion of the Convair-Lear, and partly on the early turboprop transport design study which Martin prepared for United Airlines back in 1946, the Martin 20-4. This was to use the then prototype General Electric TG-100 turboprop rated at 3300 shaft hp later chosen by GE.

U.S. and Russian Air Power

(AVIATION WEEK Figures)

	United States	Russia
Total plane strength	13,000	74,000
Strategic bomber strength	400*	1,500**
Annual production	50†	150
Fighter strength	4,900	7,500
Annual production	1,100†	1,800†
Tactical aircraft for ground support	4,000†	7,500
Annual production	None	1,800
* 8-10, plus 70 B-36's		
** 8-20 types, possibly more improved types		
† 100-150		
‡ Advanced jet types		
§ Assigned to USAF and Navy Reserve components		

Sen. Millard Tydings (D, Md.) chairman of the Senate Armed Services Committee reported in comparative head and tail power as follows:

► **ARMY.** Russia has 100 battle-trained divisions for immediate use and 100 additional divisions which "can be quickly activated," compared with the U. S. total of 18 divisions.

► **NAVY.** Although "fairly superior," it is doubtful if the U. S. Navy could keep the sea lanes clear for transport operations in view of Russia's rapid advances in submarine development.

Cracks Showing in Defense Ceiling

Consideration of Russia's growing power and end of atom bomb monopoly weakened Johnson's economy stand.

Russia's growing military power may detract a cracker of the Truman-Johnson advantage \$13.5 billion a year and may no defense expenditure. Progress is stronger for continuation of the week-end U. S. Air Force to a strength capable of challenging as strong as strength with atomic defense and offensive operations pending mobilization.

Washington officials, yearning for a "total proactive economy" under a balanced national budget—both \$13.5 billion a year for defense, the country is running a \$5 billion a year deficit—may reluctantly facing two on present lists.

► **Russia's development of the atomic bomb** means that the country's best

defense against attack, its monopoly on a monopoly of the devastating weapon, has been eroded—or will be in a few years in Russia's quest for quantity production. Success of Defense Louis Johnson's coalition, that the country can manage its *Army, Navy, and Air Force* and still be strong against attack because of atomic monopoly is being checked now.

► **In all other categories of armed strength** the allies today are already tapped in Russia's favor. In a few years they will be overwhelmed in Russia's favor, if the Administration sticks to the course it has chosen. The largest defense expenditures made down to \$13.5 billion a year, while Russia pursues an all-out armament building program.

► **First, Eisenhower** Chief of Staff estimates that an USAF at initial defense to drive off an aggressor, with defense and offensive operations. General support would come from other elements, but USAF would be the main effort to sustain the U. S. position during an 18-month mobilization period.

In testimony to the House Appropriations Subcommittee on the Armed Services, Air Force Secretary W. Stuart Symington presented this realistic picture of USAF's ability to meet an atomic aggression:

► **"The Air Force position** has always been that a program of 70 percent or an equivalent is essential to the minimum protective security of the United States." Symington, Symington added, "Under normal conditions even this figure should be looked at. It may be low."

► **U. S. has 44 offensive groups** and 4 checkmate groups at present.

► **Under the Administration's** mobilization program of \$13.5 billion a year for aircraft procurement over the next five years, the USAF "will gradually deliver one" to an effective 34 groups in 1954, a point at which it is interpreted Russia will have an atomic capability to give confidence of victory in war. The reduced procurement in the 1950 and 1951 field years will show being reflected in reduced USAF strength, but as the USAF strength is being steadily, strongly, maintained at 48 groups by delivery from procurement obligations entered into in the 1948-49 fiscal year, will develop rapidly.

► **It is possible the armed and modernized 45 groups beyond last 1970.** USAF's annual investment allocation would have to be boosted from \$1.3 billion to \$2 billion a year.

Symington's testimony was also new to the House in its testimony to the House defense on the floor of the economy and politics.

► **Pentagon Backlog—**After Symington stated in a public speech that Russia

now has "the world's largest aircraft air force and largest submarine fleet, and if they chose to mount a surprise attack against any part of the United States . . . we have no more defense against such an attack," Johnson announced 22 senators-members of the Armed Services and Appropriations Committees to a Pentagon "briefing session" at which the Joint Chiefs of Staff gave assurances that Johnson's outlook program was not interfering with the country.

Next, Johnson played the gun with an answer to Symington's testimony before the House Armed Services Appropriations Committee. The day before the scheduled release date of the Symington testimony, Johnson released a chapter out of his unclassified report claiming that his outlook program was strengthening defense as well as saving expenditures. The summarized report, now at the printer, was not scheduled for public release for another two weeks.

Then, possibly following the release of the Symington testimony, Johnson called the 22 senators to another Pentagon "briefing session." At this session, in addition to defending his economy program, it is confirmed, Johnson also opened the door to a possible "casualty" for a substantial increase in the current USAF program, and supporting increases for Navy and Army programs.

► **Tying on Step-up**—After the session, Sen. Michael Twyman, (D. Md.), chairman of the Senate Armed Services

Committee, told Americans Week that a stepping up of the USAF program "hangs on several uncertainties."

This is the overall defense budget picture.

► **The State Department**, deeply concerned over the loss of international prestige resulting from Johnson's economy program, is pressuring for a strengthening of the armed services and a speed up of the \$1-billion Foreign Arms Aid program planned for this year. \$50 million of this program is earmarked for USAF and Naval aviation equipment.

► **Retention in Congress** is an assurance to the President's \$13.5-billion military budget means strong Rep. George Milham (D., Tex.), chairman of the House Appropriations Subcommittee, estimates that his group will cut back the \$13.5 billion over budget. Sen. Elmer Thomas (D., Okla.), chairman of the Senate Appropriations Subcommittee on the Armed Services, plans "to cut it down as much as possible."

Moving public concern over the national defense budget at a level that a outlook would be accepted in five areas, and indicates that more increase is now likely.

But, development and price agreement with the defense industry has the determining USAF for the next few months.

After the November elections, with political pressure for a balanced budget eased, the Administration may be ready for more selective plans for a substantially increase USAF strength.

B-52 Deferred

Air Force studies B-36 modifications; sweep-wing turboprop is eyed.

USAF this week confirmed a report (ANATION WEEK, Feb. 27) that it plans to defer production of the Boeing B-52. The scheduled increase to General's B-56 replacement "Big Stick" of the Strategic Air Command, the B-52 prototype is scheduled for flight test in 1954.

While Air Force officials admit only that "studies are being made to determine the extent to which the B-36 may logically be expected to develop with changes in design and power," but that the engineering design studies for a swept-wing, turboprop version of the B-36 are already under scrutiny of USAF bomber design section.

These factors behind USAF decision to cancel B-52 production in favor of the B-36 is an Administration budget concern. The B-36 now costs approximately \$4.7 million only 1954 production of the B-52, preliminary cost estimates indicate, was set at \$7.5 million—no addition to the cost of tooling up for quantity production. But swept-wing version of the B-36 can be produced with relatively minor tooling changes.

Secondary factor influencing Air Force is that of the B-36 in the element of time. Joint Chiefs of Staff troubles call for a strategic (long-range)

very heavy bomber fleet of six groups by June 1, 1954. Today we have only two fully equipped B-36 groups. A third is rapidly building towards completion and a fourth is scheduled for completion only in 1955. The remaining two are scheduled for conversion from presently obsolete B-29 groups to B-36 by spring of 1954. This will provide 100, which contrast USAF's Strategic Air Command, with 180 B-36—four all purpose heavy bomber groups and two heavy communications bomber groups.

► **Consider Two Engines**—Development studies of the turboprop version of the B-36 (ANATION WEEK, Mar. 14, 1954) first considered use of Allison double turbine T-40 5500-hp turboprop as power. Present planning indicates probable ultimate use of 5000-hp Pratt & Whitney turboprop engine currently under Navy development contract.

Prototype turboprop version with conventional wing configuration will be B-36P and is scheduled for flight test

early next year. Swept wing, turboprop version will likely be assigned an entirely new USAF designation.

► **B-36 Concept**—Decision of the joint chiefs to hold to the B-36 is disconcerting of their strategic defense concept through Jan. 1, 1955, to present inability of current jet fighters to make significant percentage of successful attacks on the bomber. Key to present role of B-36 concept is its presence over at 40,000 ft. and above and the subsequent shift to fighter-bombers below the transport, on the size of the transport, that has not as yet been fully explored.

Present performance of the B-36 with full equipment and 30,000 lb. load is reported officially as 372 mph true air speed. Jet pods added to B-36 would have added the speed to 450 mph. Sweep-back of the outer wing panels of the B-36 plus turboprop engine installation will up performance of the bomber to an expected 500 mph.

This changes the present Mach numbers from .69 to .75. Current top speed of USAF is at Mach 1.50 mph speed at 55,000 feet.

► **Interceptors**—The low wing loading of the B-36 already makes it possible for it to outmaneuver the fighters which have a higher wing loading. Fighter's margin between top speed and subsonic speed is relatively narrow at 40,000 ft. and restricts them to shallow 15-degree turns.

Rate of climb at present jet fighter levels to 40,000 ft. is not fast enough to allow them to intercept the bomber. The B-36 takes at least 100 ft. to target and drops bombs. Early warning radar gives less than 10 minutes warning of a B-36 approach while fighter takes 15 minutes to reach 40,000 ft. Even at 40,000 ft. B-36 is clearly visible from the ground, jet fighters have been unable to climb to 40,000 ft. in time to position themselves for an attack before the bomber made its drop.

arrange to do maintenance work on planes of another airline. Several such agreements already are in effect.

► **Technological improvements** which cut down amount of maintenance and overhaul necessary. Also, better, but fewer, planes might offset this.

► **Moving of bases or maintenance work**, such as Pan American Airways' current shift of much of its Constellation work from LaGuardia Field to London.

The wisdom, of course, is caught in the familiar argument of overhead vs. equipment, efficient operation. But airline management in this phase which is being spread out among firms. There is the Civil Aeronautics Board which publicly promotes interchange agreements and mergers. Then is the terrific capital investment involved in setting up to do all maintenance. There is the Pan Am case for instance) the time, distance and money involved in ferrying planes an European route back to the U. S. and the foreign revenue to Pan Am's credit abroad.

► **Old Inmate-Job security** is set a new question in airline negotiations with ground workers. But because the points listed have become a greater threat to the union in the past year, TWA, the first group ever to indicate of standing firm. Job security is a major issue in current TWA negotiations with TAA, and in Northwest Airlines' dealings with its union of ground employees.

The union's campaign against subcontracting has an element of irony. For several years, independent overhaul firms have been performing "posited maintenance and overhaul." The airlines were able to load and unload their own maintenance facilities. But complex aircraft such as the Boeing



STRIKERS PICKET American Airlines office in Chicago Airport after end of talks.

'Job Security' the Big Issue

American Airlines faced by union demand—reinforced by strike—that maintenance work be kept at home.

With less than half of its normal number of flights operating, and with many picking up from a strike of its 4,600 maintenance workers, American Airlines last week faced up to a tough problem that other major airlines will have to meet before the year is out.

Two of the most at stake—safety and movement—payable to the day could be compromised without ground staff. The third was the big

one. The union (Transport Workers Union, CIO) calls it "job security," and it is a prime source of all airline ground employees. But airlines call it "management policy."

► **Everybody agrees**—is a nutshell, here's what it's all about. Job security, as the strike is affected by four things: 1. Subcontracting of maintenance work to outside contractors or other airlines. 2. Interline agreements pending for one



SIB KILLER HO4S NEPTUNE

Just in flight photo of Navy's F2V-4 Neptune long-range oiler, anti-submarine patrol bomber. Designed by Lockheed Aircraft Corp. for the Navy to carry four torpedoes and four missiles and one mine.

hugs to chop is a substantial support area. They concern a microphone which is automatically lowered to a preset depth to pick up sound of submarine propellers and transmit them to the aircraft. The F2V-4

carries an ample amount of torpedoes, rockets, bombs, mines, machine guns and repels its 28-man crew to meet any situation it might encounter. Note antenna beneath fuselage.

Two Major Distributors Combine

In the fiscal year ended Sept. 30, 1949, Air Associates had net sales of

► **Air Associates Gains**—As a result of the new acquisition, the Teterboro company assumes control of a business having gross sales unofficially estimated to be approximately \$1 million yearly, and with branches at Denver, Colo., and Salt Lake Ave. Airport, Colorado, Ohio.

► **LIGHTPLANE COST ANALYSIS**—Booklet entitled, "Light Airplane Operating Costs," based on recent experience with 32 school-owned planes of various makes, has been prepared by Institute of Aviation, University of Illinois. 20 February.

STRETCHING GLIDE—Much Alcatraz recently put out a bulletin to several of Borman, showing a technique for use in stretching. The technique for use in stretching, glide used for movement range and muscular relaxation. The technique for use in stretching, glide used for movement range and muscular relaxation. The technique for use in stretching, glide used for movement range and muscular relaxation.

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take off and landed at single landing strips in England, and virtually eliminates danger of making a ground loop after landing out of the wind. Wheels can be used up to 40 deg. deflt.

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business of oxides and metals, oxides
and carbides, and development stem-
ming from the background on catalytic
catalytic beds.

In the latter category, the develop-
ment and evaluation of advances of
metals carbide and cobalt for rotor
blades is well advanced.

In general, the surface has only been
scratched in the detailed development
of bodies of refractory carbides, as
oxides, borides, nitrides and the like
study, is combination with each other,
or combined with metals.

It is not surprising that the oxides
have received more attention than the
other new materials. They are more
available on more easily prepared, and,
of course, more stable in the existing
atmosphere environment in service.

► **Pointing**—After selection of the new
materials, the next major problem is to
form them into some desired shape. The
new materials for forming usually
consist of fine, irregular particles. The
use of various organic compounds with
these powders, as binders and plasticizing
agents, apparently has progressed to a
point where they are commensurate
with the jet engine, forming.

It is the hoped-for result of a problem to
use any of the conventional ceramic
forming techniques of dust pressing,
plastic extrusion or slip casting in the
fabrication of shapes of such materials.
Also, it is often possible to produce
these shapes to have sufficient strength
for machining readily while in the
green, unfired state.

Finally, after appropriate curing, or
firing, the formed shape is subjected to a
heat treatment of value. The changes
occurring in the internal structure
during curing determine the
properties of the product.

The question of oxidizing is not
fully understood at present and the
action is influenced greatly by several
factors. For these reasons the develop-
ment of bodies is hindered most in
the phase of research.

► **Difficulties Encountered**—An exten-
sive amount of service tests on both
oxide and metal-bonded titanium air-
blade bodies at temperatures above those
presently used with alloy blades reveal
certain problems in the use of ceramic
bodies in turbine rotors.

These were those concentrations be-
tween wheel and blade where the cer-
amic blades were substituted directly in
present metal designs.

Severe thermal shock, resulting from
failure of the air supply, caused blade
fracture, and mechanical shock prob-
lems were also encountered.

It is interesting to note that such
deterioration of the ceramic blades in
these service tests is traceable to a lack
of ductility in the bodies. If a ductile
body exists, we are unaware of it. Also,

the possibilities of developing such a
body seem remote.

However, if ceramic bodies are to re-
tain their solid place in turbine tech-
nology, the gas turbine engineers must
cooperate by designing machinery
which more adequately accommodates
these apparently inherent shortcomings
in ceramics.

The lack of ductility in ceramics
means that mechanical shock and stress
concentrations are expected to present
critical problems. Accompanying the
brittleness, some of the bodies also have
excessive thermal stress limitations.

Minimum performance from ceramic
bodies in rotor blades, therefore, de-
pends on design and operational ad-
justments to counteract this weakness.
These adjustments, for the most part,
involve problems in gas turbine map
moving.

► **Engineering Cooperation**—Evaluation
based solely on property determinations
shed little light on the influence of
lack of ductility on service perfor-
mance. For example, thermal shock re-
quirements for a given use cannot, at
present, be stated in the thermal shock
properties of a material. The require-
ments depend on design as well as low-
temperature characteristics and the prop-
erties appear to depend on the mag-
nitude of several other physical properties
at the time of failure.

Severe test of simulated service test,
therefore, is required for adequate ap-
proach, and the need for strictly gas
turbine engineering is apparent here.

Thus a further consideration which
emphasizes between ceramic and gas
turbine engineers must be beneficial.
Ceramic bodies are inherently stronger in
compression than in tension, as well
as inherently brittle. Compressive
strength of some of the oxide bodies
are of the order of ten times their
tensile strength.

Thus, of course, indicates that the
best design would have ceramic rotor
blades enter predominantly in compres-
sion, as subjected to compressive loads.

If service design could be evolved,
guaranteeing often prohibitions of mak-
ing thermal and mechanical shock prob-
lems, as failures from such shocks prob-
ably are feasible in nature.

If, on the other hand, the blades are
subjected to compressive loads, present
bodies might be used. These bodies
lose their strength but better shock
resistance than would design bodies.

► **Static Blade Data**—With their lower
mechanical requirements, static blades
offer a somewhat more fully feasible for
ceramic bodies than rotor blades.

Ceramic static blades, made from
bodies has weak, for rotor blades, but
well used thermal shock resistance,
might be satisfactory.

Even without higher operating tem-

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Indicators of the engineering limitations within the Pacific have centered in the fact that a typical pre-channel engineering system equipped with power supply weights (2 pounds) and operates only 150 miles within. Navigation was inadequate to provide line of sight ranges as 1100 miles or more for Berlin Pacific Telecommunications Systems. Regularly from qualified companies and agencies for complete engineering design and layout.



Business Engineering Office 612 1-84-400, N.Y.

permanent, it is possible that such blades would reduce weight and cost if used to replace metal blades on present designs.

As in the case of rotor blades, physical properties cannot, at present, be related to service requirements in a manner suitable for precise finished approvals. However, in approximate terms,

Bodies, able to withstand the thermal shock by virtue of being porous, might cast which are strong enough. There is sufficient background on solids, such as polymers, steels or alloys, and on alloys for their quick evaluation as primary constituents of each body.

Because of the considerable progress in ceramic research on protecting graphite bodies against oxidation, there also are possibilities. Certainly they would assist the thermal shock and, perhaps, the corrosion and mechanical stress.

Although limited in temperature resistance, fused silica and cordierite ball-jars should warrant detailed evaluation because of their low thermal expansion, resulting in good resistance to thermal shock. They might be satisfactory for fermenting extremely thermophilic

High conductivity bodies, such as those of silicon carbide or fibrous carbide, also have good shock resistance and may work.

► **Lower Coatings**—Ductility undoubtedly is necessary in the combustion chamber liners of present design, thus demanding the direct substitution of ceramic liners for the sheet metal.

There are indications that metal supported ceramic liners will withstand the conditions of service.

Also, ceramic bodies might be used to insulate combustion chambers if the need becomes sufficiently acute to justify design changes. Considerable success has been had in so insulating much better rocket chambers.

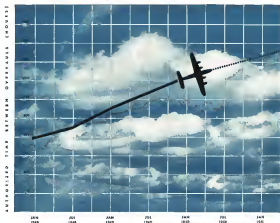
In addition to the work on ceramic bodies, a large portion of the ceramic research pertinent to gas turbines is devoted towards developing and evaluating refractory ceramic coatings.

Such coatings seem particularly attractive for immediate use. They are not expected to afford outstanding benefits, but they are likely to extend significantly the usefulness of alloys and, few, if any, design changes are anticipated in order to use them.

Primary purpose of the coatings, presumably, is to seal the metal surface against corrosive attack and, secondarily, to provide thermal insulation. Not much can be expected from them as insulators, since they must be thin to be tough and adherent.

► **Coating Types**—Most of the work on coatings has been confined to the enamel types. These consist essentially of a thin layer of glass and, as such, are

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More flight hours, more profitable airline operation, are end results of this phase upward trend in the authorized time between overhauls of Cessna engines.

Wright Cyclone 1950 as the Lockheed Constellation serves hundreds of over-haul and work-plus-change hours.

● **NEWS OF THE MONTH** is the endorsement record of the Wright Cyclone 1880 on the Lockheed Constellation, despite the short time it has been in production for airline service.

• In the brief span of two years, this 2500 horsepower aircraft engine has extended utilization time between overhauls from 600 hours to 1200 hours in fleet operation.

● In addition to the outstanding performance record, a nearly 70% improvement — from 300 to 500 hours — has been effected in the authorized spark plug change time.

● Both models reflect the sound engineering design and built-in durability typical of Wright Cyclone engines... characteristics that have produced these gains in authorized overhaul time... corresponding reductions in overhaul costs... and customer-satisfying schedule reliability.



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B Cells should be "stable" of place, with sacs and wings designed to soak up trace of virus, collapse away from the cabin

Crash Safety *Can* Be Engineered

If today's highline incorporated all the safety features shown in the accompanying sketches, crash casualties would be drastically cut.

Balanced exclusively to Aviation Week, these sketches illustrate many of the protective devices proposed by Cornell University's Cock Injury Research group—after eight years of thorough study of nearly 1000 lightplane accidents.

- **Body Rugged**—These safety features are based primarily on evidence that the human body, properly supported, can take much impact forces better than are existing lightduty.

It already has been proven that persons, when supported, easily can withstand impact forces up to 35 Gs (Aviation Week, Feb. 22). As for the human body's ability simply to survive crash forces, the indication is that this figure is near the bottom of the scale.

► **Make Plans Rugged**—But while a person harnessed in a seat can take it easy, a 35 G impact is more than conventional aircraft structures can withstand without destruction of the cockpit, so for a CIR, you can determine:

CIR believes private planes should have rugged structures and be able to past pressures which can stand up to 25-35 G crashes at least as well as the pressure in the plane. Give the occupants full a chance and "they'll live over from most run of the mill crashes." And more people will be interested in having small planes.

Even if occupants are not properly supported and sleep into cockpit structure is a crash, investigation points to the fact that chances of survival are reduced considerably if there are loose lethal objects, such as mugs, seat backs, instruments, etc., within range of the head.

High De Haven, GIB, detects, states that injuries are "mechanical results" which largely can be controlled by circuit design.

• **Lessening Dangers**—Flight has brought with it the possibility of dangerous crash landings. But research now gives promise of telling a great deal of the story out of accidents.

The course crash engineering a following logically leads to the day when occupants in private planes can report to service without diagnostic injury when they crash at speeds up to 70-80 mph—whether the plane has

vertically or at an angle, or tracks lead us into an obstacle. Even now, with virtually no crash protection, only about 10 percent of the persons usually involved in small plane accidents are fatally injured.

▶ **"Capsule" Safety**—It may not be too far in the future when occupants will be supported to exacting requirements in a structure which forms in effect a "protective capsule", carefully engineered not to collapse when the plane crashes into the ground up to a given speed.

If the pilot, with this standard of

protective built-in his phone, is not an accident. The phone is "safe" flight speed in times of trouble, he can expect the structure around him to hold up, to stay in his seat, and to withstand the shock when the crash comes.

There now are plans in the design stage, providing protective features which, according to Dr. Haven, "may mean pilots a greater degree of safety in the air than presently exists on the highways."

► **Proposals**—Keyed here to the accompanying Descriptions are descriptions of major safety proposals made by CIR to increase cost-effectiveness and occupant survival in light-trail accidents.

A In place, left, pilot was close to nest with little cross-energy-absorbing structure and distance between him and target. Arrangement is additionally dangerous by placement of gas

tank between pilot and engine. Aside from the hazard, pilot often is crushed when engine pushes gas tank and instrument panel into cockpit. Also, because of his forward position, he virtually "lands on his feet" in many crashes, with multiple impacts to lower extremities.

Plans, right, has structural stringers now incorporated in usual floor plate craft. Pilot's seat is 7-10 ft from nose, and tanks are placed in wing. By providing more structure between occupants and impact point, there is more opportunity for structural collapse and



C Safety factors that can be incorporated: 1. Study had in case landing gear collapse. 2. Engine placed low for improved visibility. 3. Firewall located in bulkhead. 4. Large passenger. 5. Stronger fuselage. 6. Stronger safety belts. 7. Check engine switch.



D All points in cabin and surrounding area are designed to keep structure intact and protect occupants in a crash

greater absorption of trunk energy ahead of colon.

In line with this is CIRA's finding that there should be "inter consultation between energy-shielding companies of aircraft and numerous safe flight speeds." At present stage of aircraft engineering technique, "tuned crash protection rapidly becomes impractical in small planes at speeds above 60 mph."

B Whether high-wing or low-wing configuration is used, cabin section should be strong point of the structure, and forward section, wing panels and tail should be designed with decreasing structural strength away from cabin to give progressive collapse characteristics.

The Hansen tests that if systems were undertaken to analyze energy-absorbing properties of structures under dynamic loads, scientific data gathered in these experiments would allow major increases

re crash protection with extensive weight penalties

C Shanty keel or skid (1) permits craft to slide instead of plowing into ground in low angle accidents. In this type of crash, bottom edge of first rail is present usually after going into ground, causing extremely sharp decelerations.

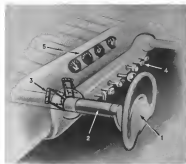
To prevent engine (2) from giving into cockpit, heavy firewall is backed by secondary, lightweight bulkhead (1). As trapped between bulkheads provides "exceptional resistance to telescoping" of cockpit over engine section.

For greater forward visibility, even with pilot seated further aft, engine is located so that cowling can curve sharply downward from windshield, leaving only narrow cowling section at center (indicated by dotted line). A larger propeller is suggested at a slightly higher position in line with gear at V-hull base (6), to not nose down.

Radder pods (5) are designed to adequately support seat, while safety belts (6) have holding capacity of at least 25 G forward, 20 G upward, and 5 G to side. Belt loads should be carried by primary structure. If attached to seats, both structure and seat anchor age should be stressed to take equally heavy loads. An impact switch (7) cuts off circuit at battery when longitudinal deceleration is more than 6 G.

D Strong hurricane protection is provided by "shutout" shutters (1). All housing slopes away from porches so there is less chance of direct wind blows. Also, windbreaks and side windows (2) are designed to "pop out" instead of shatter if struck by occupants. Metal flooring or thin metal or glass covering over plywood (3) lessens possibility that occupant's legs will be forced through cracked bottom.

Fuel tanks are strong enough to withstand crashes in 20 G crash, and in



F Control wheel and control column can be designed to support body when it is thrown forward, instead of being a space to impale back.

placed so as to make it difficult for them to be crushed or punctured in survivable accidents.

If wing tanks (4) are employed, De Haven suggests constructing them with slightly weaker outboard ends so that if they burst in a crash, "the gasoline internally will be sprayed away from engine, cables and occupants," thus lessening the damage.

GIR is a strong advocate of shoulder harness (5), pointing out that if it were used routinely "it would not be necessary to modify, strengthen, and redesign structures specifically to protect the head. However, no modern personal aircraft has shoulder harness as standard equipment and experience has shown that few pilots understood its value. . . . Hence, it is important to design when so as to minimize injuries resulting from headfalls which are due to cover up crash when occupants refuse to take advantage of shoulder harness.

E Considering that 75 percent of fatalities in survivable lightplane accidents are caused by head injuries, heavy flight instruments (3) are oriented well forward out of hand range, but closer to pilot's line of vision if he pitches over seat belt in crash, he has "right dead" (7), a seat aerial shell designed to shock head impact. De Haven points out that, while skull fractures can occur at the head strikes an unyielding object at an impact velo-

city of 12 mph, injury may be avoided at 50-60 mph if the head hits a flexible object which can "give" approximately 5 or 6 in.

Still more protection is given by mounting instruments on a spring pad secured to cockpit covering by shock granules (5) or inertia locks. In crash decelerations exceeding 5 G, instruments are thrown forward, out of range of pilot's head.

F Control wheel (1) distributes crash force over large area of chest and provides, as nearly as possible, protection equivalent to that given by shoulder harness. It is made of metal which will bend, rather than break, under heavy loads, and is attached to permit yielding, and adjustment to chest loads. Control column (2) is strong enough to resist buckling under heavy, forward and side loads and is equipped with inertia locks (3) which check rapid forward movement of column in decelerations of more than 5 G. Control levers (4) are of soft material to prevent injury and such is shaped differently so that it may be controlled by touch as well as by position. Small gears (5) also can be connected to test levers from panel.

G Front seats are adjustable, yet firmly locked to prevent loosening under safety belt loads. They are capable of supporting 20 G longitudinal loads without buckling. Where no



G Front seats, though adjustable, should be firmly fastened to floor.



H Even locking pins can be designed to absorb energy before force hits structure.

shoulder harness is used, harnesses are fast seats are hinged to swing forward, out of head range of occupants in the rear seat.

H Spring type locking gear is beyond to give remaining resistance when loaded vertically. In addition, it is attached to fuselage by jettison joint for pulling off when landing would cause normal landing gear or stretched attachment to fail. In low angle crashes the arrangement would prevent more than energy to be absorbed since it permits a greater distance of deceleration and lower G loads imposed on the aircraft proper.

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AVIONICS

Problems of Frequency Allocation

Repeated international conferences supposedly have settled question, but trail technical progress.

The radio frequency spectrum is a widely coveted, but frequency allocation is as much a matter of politics as it is of science. And in the midst of the last meeting phase of aviation lies the slow-moving machinery of international conference, which, despite its genuine effectiveness in many phases of work, seems to drag behind the forefront of technical development.

► **Megacycle Hubs**—Yet few activities have incited as much controversy as the economic and operational phases of aviation that deal with the international allocation of radio frequency. By the stroke of a pen, whole bands of frequencies can be made obsolete and entirely new band assignments made in those far-off city with an obviously vital effect on the daily operation of the huge aviation industry.

World War II aviation developments are chiefly responsible for the present chaos in frequency allocation. No international radio conference has been seriously discussing the allocation of frequencies since 1946, yet several nations operating on 11,000mc were widely used during World War II and especially have been concerned with the megacycles as high as one million megacycles. The radio frequency spectrum ends at about one billion megacycles, where the vibration becomes infrared in fact.

It is already clear that exploration of the entire band of radio frequencies is nearing completion and yet international allocation effort has not yet reached operational status, a mere 200mc. But progress is being made, however slow, and important machinery has been set up for future progress.

► **Beginnings**—But frequency allocation is no new problem. The first international conference dealing with the subject was the Berlin Radio Telegraphy Conference of 1906. The worldwide importance of the divisions made at this conference was confirmed in April, 1912, when the U. S. Congress referred the conference and the radio that made the U. S. a part of international radio frequency allocation for the first time.

The United States played host to the world conference in Washington in 1927. But it was the International Telecommunications Convention in Madrid, held in 1932, that laid the framework for the present extremely detailed and widely accepted nature of international frequency allocation. The General Radio Regulations developed by the Madrid convention was signed by the United States Dec. 9, 1932.

On Feb. 1, 1938, the International Radio Conference was convened at Ginebra for the purpose of revising the Madrid convention. This Ginebra convention was signed by the United States and 68 other countries on April 8, 1938, and its provisions are still in force nearly 12 years later.

Types, the "Ginebra Revision, 1938," of the Madrid Convention, 1932, stands today as the official worldwide allocation of radio frequencies, as well as a wide variety of licensing, procedural and other provisions.

► **Postwar Meeting**—But the nations have not been idle since 1938 in the international frequency field. All work in this field was suspended at once during World War II, which is the chief reason for the long delay in revising the code.

The first postwar international meeting was the International Telecommunications Union Radio Conference of 1947, held in Atlantic City. This conference undertook to establish satisfactory through the use of which a complete revision of the International Frequency List would be obtained.

But of even greater importance was the decision to undertake this revision on the basis of engineering, technical and strict operational requirements, rather than the traditional "general agreement" method used previously.

► **Outgrowth**—Out of the Atlantic City meeting came these developments of primary importance to U. S. interests. First, the "Provisional" Frequency Band was established to coordinate full-band frequency allocation work.

Secondly, the world was divided into three regions for the purpose of frequency allocation work in order to break down the job into regional areas. The United States (and all the Americas) falls under International Telecommunications Union Region Two.

Thirdly, the International Administrative Arrangement Radio Conference was established as a separate activity, concerned solely with coordinating the radio frequency bands. It is the responsibility of the IARIC to transmit to the ITU any frequency assignment plan it might prepare for action pending at the new International Frequency List.

► **Inter-American Activities**—At this point it is of interest to digress a moment into the conference activities of the inter-American countries, separate as they are, from the international allocations.

The first inter-American radio conference was held at Mexico City in 1931, to explore the possibilities of inter-American agreements. First inter-American inter-American conference was held at Havana in 1937 and important decisions were made. This Havana conference drew up: (1) an Inter-American Radio Communication Convention, (2) an Inter-American Arrangement Concerning Radio-Communications, and (3) the North American Regional Broadcasting Agreement.

The Convention, which was ratified by the United States and the majority of the participating countries, generally covered organizational and general policy agreements among the American republics and Canada for the handling of mutual radio communication problems.

The Radio Communications Arrangement was agreed by the Second inter-American Radio Conference at Santiago in 1940, and, after appropriate approval, entered an effective international agreement.

► **Rio Conference**—In 1945 inter-American meetings gathered at conference at Rio de Janeiro for the purpose of revising the 1937 Convention of Havana and thus was accomplished The Radio Communications Arrangement of the Havana conference was not revised at Rio. At this time it was decided to hold the World Telecommunications Conference in 1947 and the delegates at Rio agreed to withhold their signatures until this conference in Atlantic City.

The Rio conference, however, prepared a Convention, in which greater detail than available previously and, in part, later, act as a small scale structure that served as an effective model for the large Atlantic City conference two years later.

► **After Rio Meeting**—The Rio de Janeiro Convention, unfortunately, struck the type of snag that makes international agreement so frustratingly slow. The Brazilian government was unable to send certified copies of the Rio Convention to participating countries.

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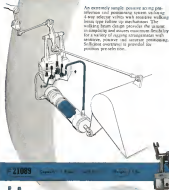
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adoption of the Region Two plan at Washington was a major accomplishment.

► **Conditions**—Because of its regional nature, one of the final elements of the Washington Conference program Senate ratification for action. The "Inter-American Radio Agreement, Washington, 1949," which requires the Senate Agreement, will require the approval of the President to become an order in a series of Executive Agreements. It will come into force on April 1, 1950, if the nation has in fact been accepted as and will be leading only as other parties that accept it.

The "Region Two Recommendations and Resolutions" will be submitted to the Provisional Frequency Board, where it will be subject to consideration and comment, after which it will be submitted to an Extraordinary Administrative Conference. The "Report to the International Administrative Association Radio Conference Second Session," after action at that session, will be incorporated into the worldwide plan for the allocation of exclusive high frequencies allocated to the international mobile service is finally developed by the Provisional Frequency Board.

► **Future**—The next step in that necessary mobility program will be U. S. participation in the Extraordinary Administrative Conference, to be held Sept. 1, 1950, at a place not yet named, and the next worldwide conference in Buenos Aires in 1952. The international phase of the problem next will be considered at Montevideo also in 1952.

In the interim the U. S. Government invites funds that it will continue active participation to the fullest extent in all conferences of the ITU and its several branches, particularly the IARCC meetings.

In such a manner does the complex machinery of international agreement work. Only the broad phases of the problem of frequency allocation have been outlined.

But the magnitude of the problem is seen in the fact that for every band of frequencies there are hundreds of applicants, each with their particular interests and vast supporting data.

To make matters worse, a certain degree of secrecy is maintained by many of the delegates (including those of the U. S.) to avoid "showing their hand" in the matter of what frequency bands they will ask for themselves and support among their constituents.

It is said that backstage that the monumental problem of international exclusive frequency allocation is judged bad from that backstage that it is apparent that considerably rapid progress is being made, even though such progress seems seemingly slow to technicians in the field.

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each firm. Other placament was made on the basis of competitive bids. Subcontractors were required to state their willingness to participate for the duration of the program and to accept competitive.

In the first six months of 1944, GE subcontracted more than \$24 million in orders to some 1300 companies. **■ Reports to Vendors—**Contract studies are made to appraise design and production, and to reduce the amount of drawings submitted in each unit. A subcontracting section maintains a card index on each component part used in the engine. A scheduling section issues say design changes. Then critical instructions are issued to subcontractors. Vendors receive weekly progress reports with definite instructions to speed up or slow down production in order to maintain the flow of parts at the scheduled rate.

Each engine undergoes a test run, then is disassembled and inspected for wear parts and returned for a final run. Careful coordination of output means through the testing phase, so testing will not slow the production line.

One major benefit of the Lockheed operation is steadily apparent. GE built four at Lynn, Mass., also four out the 1-15, but Lynn is also the site of design and development activities. In view of a national emergency, the heavy demand on the Lynn operation would probably result increase in actual production there.

But, following "the Lockheed philosophy," subcontractors can expand and a substantial increase in capacity can be attained when necessary.

PRODUCTION BRIEFING

■ Casualty employment will be increased 10% to 15,000 at the Ford-Warren division, and will add the new center 4500 square at the San Diego plant during 1950, company officials announce. Activity in San Diego will be centered around as order for 48 T-36 reconnaissance aircraft, 16 transports, two XP-52's, four scout bombers, completion of Convair-Learns, and guided missile. President Lammert T. Cohen and General experts to deliver live or to train pilots to Redford base if money to change problems can be solved. The business there is a market in B-24 for 15 or 20 additional Convair-Learns when B-24s can be arranged.

■ Pratt & Whitney Co. has arranged a new plant at Clinton Heights, N. Y., to produce boosted steel piston blades for turbopropellers. The first blades tested government order for these blades.

■ Aeroquip Corp., West Chester, Pa.,

is currently engaged in research on application of stainless in improved design of aircraft materials and components and systems. Several new types of mechanical ultrasonic generators are also being developed.

■ TROCK, Dallas, Tex., has received a \$285,000 contract from USAF to design, engineer, construct and install an integral blow-off system for ground testing on two Northrop YC-123's. The latest for aerial rescue missions. Plans call for delivery to be delivered to the company in April for installation, with remainder during at one-month interval.

■ Minneapolis Honeywell Regulator Co. has named St. Louis branch and branch. Instruments division into new office quarters at 4350 Olive St., St. Louis.

■ Rhodes Lewis Co., designer and maker of aircraft and engine equipment, have moved from 4068 W. Jefferson Blvd., Los Angeles, to a new plant double the size of former quarters. New location is 1452 Bessie Drive, Culver City, Calif.

Latest USAF Bid Awards

An Material Command Procurement Division makes available to Aviation Week the latest bid awards, shown on this page. Requests for further information should be addressed to Contracting Office, AMC, Wright-Patterson AFB, Dayton, Ohio, attention NCPD:007.

AWARDS

For spray booth (10-1001):
Deshmone Company, Toledo, on a bid of \$111,000.
For aircraft shelter (10-1002):
Bullfinch Aircraft Co., Detroit, on a bid of \$244,000.
For laboratory (10-1003):
Lambert, Inc., Minneapolis, Minn., on a bid of \$140,000.
For aircraft shelter (10-1004):
Bullfinch Aircraft Co., Detroit, on a bid of \$244,000.

For 1000 sq ft aircraft shelter (10-1005):
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For 1000 sq ft aircraft shelter (10-1006):
Deshmone Company, Toledo, on a bid of \$111,000.

For 1000 sq ft aircraft shelter (10-1007):
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For 1000 sq ft aircraft shelter (10-1008):
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Deshmone Company, Toledo, on a bid of \$111,000.

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Deshmone Company, Toledo, on a bid of \$111,000.
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For 1000 sq ft aircraft shelter (10-1041):
Deshmone Company, Toledo, on a bid of \$111,000.
For 1000 sq ft aircraft shelter (10-1042):
Deshmone Company, Toledo, on a bid of \$111,000.

For 1000 sq ft aircraft shelter (10-1043):
Deshmone Company, Toledo, on a bid of \$111,000.
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Deshmone Company, Toledo, on a bid of \$111,000.

Pilots demand it! Instruments deserve it! Safety requires it!



Engine Equipment
Air Pumps
Engine Starting Equipment
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Power Supply Descending
Equipment
Power Supply Reversing
Equipment
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Flight Instruments
Automatic Pilot
Right Hand Control System
Engine Instruments
Navigation Instruments

Pilots today are demanding an independent standby power package to insure operation of their electric flight instrument group. For they know that even the finest instruments money can buy, are reduced to dangerous inabilities when faulty power renders them useless as power lines to give incorrect indications. Eclipse-Pioneer's answer is a two-component package consisting of a lightweight ENGINE DRIVEN ALTERNATOR, and a small, semi-mounted POWER FAILURE INDICATOR. Normally, the small black face of the indicator is inconspicuous in its mounting near the gyro-horizon, but if conventional power becomes faulty, a fluorescent disk instantly appears—giving the pilot approximately four seconds in which to standby power before the gyro will freeze. Two alternators are available for this system: one for electric gyro flight instruments only and the other for an electric compass as well as the flight instruments. Either one is conveniently installed on the engine vacuum pump drive pod. Here is instrument insurance that pays its own premiums—another example of the thinking that has made Eclipse-Pioneer the leader in its field.

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For Accurate Drilling

Swiss-made universal drilling tool, "Relax," distributed by Com Corp., 614 Chrysler Bldg., New York 13, N. Y., simplifies exact drilling of metal, drill square or hexagonal pins with accuracy of .0003 in. With economies, it drills holes in predrilled material, also cut holes for making shafts, holes at any angle, and holes in balls. Automatically indexing, self-aligning, self-centering and center-punching.

Ready to use as drilling tool, device can be used as angle compass in two planes. It moves at depth gauge and other different components on round, square and hexagonal stock, and can be used as centering pin bar.

Tool handles work pieces up to 14 in. dia. and accommodates series of cylindrical drill burrings having drill bits ranging up to 1/2 in. Accessories include V-wheel for holding pins from .6 to 10 in. dia., cone wheel for drilling balls up to 14 in. dia., and a modified cone wheel for drilling flat and concave pieces.



Sensitive Relay

For protecting audio instruments and components from effects of radio frequency or radio-frequency, Vaco MFC Co., Concord, Tenn., offers line of 500 frequency sensitive relays.

In order frequency applications, relay is designed to open when supply cut off when frequency below pre-determined safe point, ensuring protection of equipment against excessive currents caused by lowering of in-

put power which frequency drops.

Design is such that failure of relay removes all loads. Also, responsive relay can be manually bypassed for emergency operation.

With 5 amp, double-pole, double-throw contact, hermetically sealed unit can be used with voltage ratings from 75-150. Operating current is derived from main power source. Relay can be furnished to open or close at frequencies from 516 to 1000 cps with a differential of 2 to 40 cps. Weighing 1 1/2 lb., device has two diameter and height.



Sander and Grinder

For medium-duty sanding or light duty spot wheel grinding, portable or powered sand, made by Dayco Tools Corp., 21 W. Apple St., Bayshore, N. J., Glue, it and in other, irremovable improvement over previous models.

According to maker, size is 10 in. dia. lighter than previous models of equal capacity, but has 25 percent more power. Available in five models with speeds of 2400, 3600, 4500, 6000 and 7500 rpm, device is designed for use with 5 or 7-in. sanding pads. For spot wheel grinding, wheel size of 4 1/2 or 6 in. are supplied.

Powerful V-Belt

To reduce number of belts required for a fixed power transmission, "High Capacity" multiple V-belt, with 40 percent increase in life rating over comparable size, is recommended by B. F. Goodrich Co., Akron, Ohio. Belt also is particularly suitable in applications where disappearance of drive has been focal concern.

Maker states increase in capacity has been obtained without affecting belt construction or reducing safety factors inherent in standard types.



Dial Bore Gage

Quick and accurate determination of diameters of internal grooves for "O" rings, snap rings, and straight bores is assured by a new dial bore gage, offered by Rexel Machine Tool Co., 1117 Air Way, Glendale 1, Calif.

Industry is readily located on the diameter of the cut to be measured and dial sensitivity gives direct dimension read. Standard instruments measure diameter from 1 to 6 in. Two sets of instruments are offered by manufacturer. Series 5, giving direct readings in thousandths of inch, consists of the instrument, and Series 7, giving plus or minus indications in ten thousandths for any dimension to which the gage is set. Standard top sizes are 1 and 1/2 in. A, although special tops are available for measuring snap ring grooves as small as .030 in. in width.



Photo-Cell Control

For varied industrial uses, including automatic control for lighting in fabric, International Rectifier Corp., 5065 So. Victoria Ave., Los Angeles 41, Calif., offers hermetically sealed aluminum photoelectric cell. It has average maximum efficiency of 680 microns/cm at a fluorescence of 180 feet-milliwatt, with a 150-ohm external circuit resistance.

Unit is self-generating type and does not require external source of power. Electric current is generated when cell is exposed to light.

Unit operates 2 x 3 x 6 in. Active cell area of the control device is approximately 2.25 sq. in.

FINANCIAL

Airline Profits Up Market Prices

Continued dividend payments, plus debt retirement give investment and speculative value to securities.

The restoration of airline credit continues to show steady progress in the investment community.

New security price moves for airline securities in the outdoor reflection of the industry's financial health.

Currently, the most dynamic action was American Airlines' retirement of \$4,000,000 of its 3 percent debentures due June 1, 1966, in anticipation of sinking fund requirements. In this move, American has satisfied all sinking fund requirements on its original \$40 million issue up to June 1, 1961.

► **Boys to Be—**The redemption of these sinking fund bonds was accomplished quickly at a minimal discount, with the saving reflecting to the benefit of the company. Current market quotations of around 95 percent discounts are indicated, with a yield of around 3.25 percent.

Originally marketed in June, 1946, by a syndicate headed by Kidder, Peabody & Co., at a price of 102 to the public, these debentures sold at 97 during early 1948. Current market prices compare favorably with better quality corporate issues.

► **Better Stock at Capital—**A successful issue of 100,000 shares of new common preferred Capital Airlines' successful recapitalization, completed last November. Formerly plagued by the stockholder provisions of an original \$10 million convertible debenture issue, the company recently was able to obtain desirable modifications.

The original issue, reduced to \$7,165,000 by late last year, was offered for exchange into two series of new debentures. The new Series A notes are fixed interest issue of 4 percent while the new Series B will pay 4 percent interest only if earned, but is convertible into common stock at the rate of 90 shares per \$1000 principal amount of convertible debenture.

In this conversion portfolio which pushed the market price of the Series B debentures up to 108 1/2 a few weeks ago.

During this conversion drive, there have been the positive recovery that an airline security will share up. The Series A, which now represents the senior debt of the company, recently sold at \$54, indicating a current yield of around 4.7 percent. At present prices, the new securities are equivalent to a price of better than 95 on the old debentures.

These exchanges and which sold at around 78 less than five months ago. ► **Value Higher—**While having no public distribution, United Air Lines' 15 percent debentures, originally issued in the amount of \$12 million and placed with two insurance companies, have been recorded a higher market value than as a result of the improved quotations for American's debentures. In the past, the National Association of Insurance Commissioners have voted the United debt at the same level publicly offered issue by American.

Also due for retirement improvement, but not yet accomplished, are the \$38 million of TWA debentures all held by the Equitable Life Assurance Society of the United States. As of Dec. 15, 1965, the mandatory agency desired a insurance company to carry these debentures at 93 cents on the dollar. It is difficult to see, in the light of the substantial improvement in TWA's situation and ratings, how this low valuation can soon be improved.

► **Preferred Moves Up—**Preferred shares of airlines have also improved in investment standing.

American Airlines preferred is obviously improved in position as a result of conversion of part of the company's debt. These are 400,000 shares of this airline's equity subordinated. Sold to the public at around \$100 per share in June, 1946, this issue declined to around 47 in the late 1940s but trades actively recovering to a recent peak of 74 1/2.

Despite a period of financial stress, recovery of dividends, amounting to \$1.50 per share annually, have been paid in full. At current market prices, the American preferred returns an income of about 4.6 percent.

The United Air Lines preferred has made an even more pronounced recovery. These shares, with \$1,000 outstanding, were unaffected through rights to common stockholders under a trust by agreement with American Airlines Co., in January 1947, at an indicated price of around \$105. As doubt began to appear to United's credit standing, a sharp devaluation in market value developed with quotations at \$77.50 in 1948.

Here, too, the United earnings and finances improved and dividend payments were maintained, the market price of the company's preferred rose steadily to a recent peak of around \$85. At this price, the yield is around 5.2 percent on this stock paying dividends of \$4.50 per share annually.

► **NWA in Seesaw—**Northwest Airlines' move of preferred shares appears to be the most volatile among the airline equities in the industry. A total of 700,000 shares of 4.5 percent preference stock was marketed at \$25 per share in April, 1947, by a group headed by Underhill, Paine and Wadsworth. Aggressive investors attacked continued dividend payments on this issue almost at the outset, causing the shares to sink to low as \$15.50 in late 1948.

Marketed initially by earnings developed by its international route and made possible by high bond payments, a substantial improvement in the company's credit was experienced during the year. The two have been reflected in a steady higher market quotations for its senior equity. Further, it is believed that recent operation of sinking fund payments of the preference shares now have converted at a new high recovery of 213. Current quotations are around 110, providing a yield of about 4.6 percent.

► **Northwest Airlines, Inc.,** a few years ago, issued 100,000 shares of a cumulative convertible preferred stock of which around 77,000 shares are owned by the Atlas Corp. Since its issuance, however, no dividends have been paid on the Northwest preferred.

► **Continental Air Lines—**A recent action in all of the portfolios in the aviation feature. Including specific issue issued is attached to these assets together in periods of some periods because of the concentration of the company's debt.

This conversion right is of great importance where earnings begin to approximate equity and become available in the common stock as an increasing margin. Theoretical income in the preferred shares being, fixed at a stated amount, participation in a greater distribution of income that may be available to common stockholders in position of the company's equity.

Each share of American preferred is convertible into common at \$21 per share of about 4.6 percent of common for each share of preferred. Each share of United preferred has a call on four shares of its common. Each share of Northair preference is convertible into one and one half shares of common.

In periods, common stock prices of the three airlines have been below the levels necessary to accord their respective preferred a premium because of the conversion privilege.

The issue of debt and equity securities, however, continues to be determined by the earnings outlook of the separate airlines—Belt, Attached.

AIR TRANSPORT



Oswald Ryan



David Belache

When was safety first—in 1955 or 1970?

Is New Air Safety Board Needed?

Pilot union tells Congress it is. CAB says no. And each side offers figures to prove its own case.

By Charles Adams

A head-on clash between the Air Line Pilots Assn. and the Civil Aeronautics Board has developed as congressional hearings on the need for new air safety legislation.

With President David L. Belache leading the attack, ALPA has mounted Capitol Hill with a set of statistics designed to show that air safety has deteriorated badly since it was placed in the case of a CAB lawsuit nearly two years ago. The pilots' union wants Congress to re-institute the independent Air Safety Board, which was set up under the Civil Aeronautics Act of 1958 but abolished in 1960 under a Presidential reorganization plan.

► **Progress Cited**—Showing an annual 40% drop in the ALPA's CAB lawsuit filings, it was figured to prove that active safety has made remarkable progress since the independent Air Safety Board died in 1960. CAB Vice Chairman Oswald Ryan told a House Subcommittee on Foreign Commerce subcommittee that Belache's statements and statistics were "incomplete and misleading."

Belache had told the subcommittee that CAB delays in processing new safety regulations, such as requiring re-

ventilator cockpit propellers on all airline transports and raising full-face oxygen masks available on the cockpit, had contributed to a number of accidents in recent years.

► **ALPA Welcomes**—The ALPA-CAB feud on an safety procedure flared up last November during hearings on the crash of an Eastern Air Lines DC-4 and a P-15 fighter plane near Washington National Airport. Belache withdrew his representatives from that hearing after CAB rejected both the statements ALPA could place in the record and recommendations the association made.

ALPA and this action, coupled with failure of hearing officials to call witnesses any of the pilots' safety representatives who served on the investigating teams, reduced the pilots' presence at the hearing to a reorganization formality. CAB Member Harold A. Jones, senior official at the hearing, testified that ALPA was trying to use the session to plug for an independent air safety board.

Renewing his contention that CAB is "buddling" with air safety, Belache informed the House Commerce subcommittee that reestablishment of the independent air safety board, as recommended by the President's Air Policy

Commission over two years ago, is "real" legislation. Belache said that during the ASB's 1955-56 session (House August, 1955; through June, 1956) the document air transport safety had the lowest number of fatalities in its history.

► **Longest Safe Span**—For the last 17 months of the ASB's tenure there were no fatal domestic airline accidents—the longest safe span on record. Belache said that the work of 12 fatalities for each million passengers carried during the ASB's existence has never been so much approached.

At present, Belache declared, CAB and CAA, as rule-maker and enforcer, judge the results of their own activities in an objective manner. "But an independent board is based on the inner concept that the implementation and enforcement of the rules... could not be relied upon to investigate themselves in the event of conflicts and come forth with findings and recommendations that might reveal their own shortcomings, biases and ineffectiveness."

► **With Prejudice**—ALPA contends legislation introduced by Rep. Robert Cramer (D., Ohio), chairman of the House Commerce Committee, and Sen. Pat McCarran (D., Nev.), which would:

► **Set up an independent air safety board** of 11-15 non-aviation members with greater power to take over the activities of CAB's Safety Board. Two members of the new board would be pilots, one with at least 4000 h flying time in scheduled air transportation and another a licensed pilot with at least 3000 h flying time. No officer or director of an airline could be appointed to the board.

► **Authorizes ASB** to investigate accidents and report with recommendations to CAB and CAA. Although it would lack enforcement powers, ASB would make annual reports to Congress.

► **ATA Opposes**—The Air Transport Assn. said it would not support the safety board legislation. Some industry officials believe the transport pilot member of the board would almost certainly be a member of ALPA and would tend to make decisions in "self-interest" as critics. They say so many industry management membership on the board should be biased while pilot membership is biased.

Further, it is feared that ASB might make scores of economically unfavorable safety recommendations to CAB. Thus CAB would be on the spot continually, while ASB would be at a comfortable "I told you so" position.

Another part of the ASB legislation, intended to protect witnesses, would bar the use of information gathered in accident investigations "in any action for damages, for a civil penalty or for contempt of court or in a criminal case." This provision is viewed with

resignation in some quarters. Rep. Carl Albert (D., Calif.) expressed whether this might not prevent effective suits for damages or future reeducation action against drunken or reckless pilots.

► **Ryan Replies**—Both Ryan and CAB Member Ryan called the House subcommittee's attention to the case of Louis Armstrong Airlines pilot Charles R. Soto, who in October, 1947, as ejected the first Lockheed L-1049A, landing the craft into a 7300 ft dry river bed. Two Ryan said that ALPA defended Soto and opposed to introduction of any amendments of Soto or any immediate test cases submitted by members of ALPA.

"It took me," Ryan declared, "to tell that the interests of public safety were such that ALPA should have been anxious to see that the pilot received proper punishment instead of defending him. We think there is an obligation on ALPA on such situations to see that all necessary facts come to light."

Ryan said he has no recollection of any specific accident investigation in which ALPA or anyone else claimed that the mishap involved a preventable fault on the part of CAB. He warned that hastily adopted regulations may turn out to be biased.

► **Safety in Service**—The CAB member cited the fatal United Air Lines DC-6 crash near Mt. Carmel, Pa., in June, 1948, when the crew apparently was incapacitated by a combination of carbon monoxide gas which seeped into the cockpit after catastrophically was damaged in the forward cargo port following a hole for alarm Belache said that had CAB required full face oxygen masks in the cockpit, it might have been avoided by ALPA, the crash might have been avoided.

But Ryan pointed out that the cockpit actually damaged from safety since the crash to prevent further compartment fire. Two weeks later, another accident became hazardous the unsafe design which was intended to warn of a fire, and the CO₂ which was intended to put it out. The unsafe design aspect had not since been withdrawn.

► **Reusable Props**—Turning to issues about props, CAB officials said they, too, may believe, instead of protest, safety. CAB cited an instance as in months when propellers underwent no landing approach when they were not supposed to.

Belache claimed that had reverse-thrust props been required on all transports, they might have prevented the United Air Lines accident at LaGuardia in May, 1947, when a DC-4 swirled off the end of a runway during a landing. He said that CAB adopted reverse thrust in its laboratory tests, that manufacturers' propellers be removed on all airline transports. 13 subsequent accidents might have been prevented.

CAB replied that even with reverse thrust props the UAL DC-4 could not have been stopped in time, and either accident cited by ALPA would have occurred. Belache officials pointed out that out of the 15 accidents listed in the DC-6 case, five with reverse thrust propellers are not available.

► **Records Compared**—Ryan reported that passenger fatalities per 100 million passenger miles flown on scheduled domestic and international carriers declined from 5.2 in 1938, 2.3 in 1939 and 2.8 in 1940, to a record of 1.0 in 1949. He compared the 1,459,800,000 passenger miles flown, the three fatal accidents and the 12 passenger fatalities on the domestic airlines during the ASB's 22-month tenure with the 6,187,000,000 domestic passenger miles flown without fatal accident or passenger fatalities during the 11 months between Sept. 1, 1948, and July 31, 1949.

The CAB member also noted that U. S. international flight have, since April, 1948, flown more than 22 months without a passenger fatality.

Window Blow-out Brings New Tests

A wind-tunnel test program called off for progress of testing some poorly installed air valves, last week had trouble of its own.

As one result, a few Lockheed Constellation were being operated with temporary course changes in flight plans.

The product is a Serrinco, a two-piece window made of two metal windows (Aviation Week, Jan. 27). It was off to a first test in replacing other plastic materials and glass in passenger windows of Constellations of several airlines. The tests were when a Serrinco window of a FAA Constellation was under pressure at 28,000 ft and a deepening storm was pulled halfway out.

► **Results**—Serrinco's window immediately cracked under intense suction. FAA ordered the former window, made of Plexiglas, restored. EAL took out those Serrinco windows under test, sent one to Serrinco and is evaluating the others. TWA had only two Serrinco panels installed and replaced them. Pan Am, while the change-over was being made, was repairing that and both be restored when Serrinco-equipped planes were permitted. For about 12 hours, until it determined which change had the Serrinco window, TWA had a somewhat similar requirement.

FAA based plans of the shattered window panel on Civil Aeronautics Board's 1948 report on laboratory tests. Until completion of these tests, FAA is not allowing any constellations on the future use of Serrinco.

► **Crack**—Window was cracked, as in

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- 5	.0010
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- 12	.0342
- 14	.0467
- 16	.0611
- 18	.0616
- 20	.0620

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THE CARBIDE TOOL CO., INC.
101 SPRINGFIELD AVENUE
BRIDGE PLAZA, CHICAGO

company, inside an outer panel of Lears, which moved as a firing. Mid Lee R. Cresswell, vice president of Stern Products Co., maker of the machine, says the outer panel was badly curved, and that the window was improperly mounted. A broken outer panel could have done through the inner window.

Two American investigators at Miami, where the plane landed, concluded that the malfunction was not faulty. According to Pan American, Gene Armstrong, Stern representative at Miami, concurred in that view.

► **Outlook**—Sterners window that broke was installed last November, and has a little more than 800 hr. use. Stern gives a one year unconditional guarantee on the panel. The PAA blowout was the first difficulty experienced with

a Sterners window. But it is a serious concern to engineers. Here's why.

Other window covers will crumple or crack, so give notice of impending failure. The PAA panel, built without warning. If the PAA blow-out was due to an outright failure of Sterners, and if the material will fail without warning, airline maintenance people are weary indeed.

But Stern Products gives no notice of failure until disaster. The company says that Lockheed (which has now re-opened its own investigation of Sterners) has just placed a new \$2500 order for the material. It has sent new Sterners to the market. And it says that the PAA blowout will give further support to its argument that other windows of passenger planes should also be made of Sterners.



COMET PRODUCTION starts with 4000 workers on overtime and 16 planes on line.

Herlihy Sees Jet Dominance Near

The turbine engine within 10 years may completely replace the piston engine for all aircraft of over 1000 hp. In the opinion of J. Herlihy, United Air Lines' vice president operations.

► **United Coast**—Returning to the United States in a 12,000 cu. yd. inspecting foreign engine development and airbus operations in Canada, England and Europe. Herlihy said he was especially impressed by Coast Britain's de Havilland Comet. He flew the 40-passenger, fourjet transport at 485 mph, at an altitude of 50,000 ft. as easily as any conventional plane and without any problems of vibration.

Herlihy said that with planned improvements in engine performance the Comet would operate even higher than 50,000 ft. when placed in commercial service. British Overseas Airlines Corp. and Canadian Pacific Air Lines have placed orders for the Comet, and Herlihy estimated these companies will have them in regular scheduled operation within 18 to 24 months.

The UAL executive placed the Comet ahead of any other turbine engine development he saw on his trip

to the helicopter power plant, he declared, has interesting features for commercial use as the immediate future, but that it is the struggle jet, which is further away.

► **U.S. Lags**—Herlihy said that every thing in the way of new development abroad was directed to the turbine power plant. "Government financial aid/line prototypes development programs have prevented the British and Canadians to steal a march on the U.S. in this important field, but an American turbine development program existed, now would quickly bring this country abreast of its competitors."

► **Aids B-45 Tests**—The UAL official endorsed suggestions that the U.S. government assign some of its B-45 jet bombers to the refueling for experimental use in landing ops, thereby providing actual experience in flying turbine aircraft over American oceans.

Herlihy's trip abroad convinced him that the turbine engine "has an advantage." It's true, and nothing was stopped, he declared. "The last airline to get the turbo quarter and more comfortable turbine-powered planes into

operation will attract the traveling public. Travel in these early jets will move quickly to start, but the line increase will be justified by the added features."

Extension Likely for Western Feeders

The Rocky Mountain area is likely to keep the bulk of its scheduled feeder services for at least three more years.

This became apparent when the Civil Aeronautics Board recently ordered Monarch Air Lines and Continental Airlines to show signs why their temporary short-line certificates shouldn't be extended to March 31, 1955. Both franchises are now due to expire at the end of this month.

► **Crit. Progress**—CAB said it appeared that both Monarch and Continental have made steady progress in furnishing air service and developing the traffic potential of their routes. The Board tentatively decided to extend the two feeder certificates even before granting approval to the Monarch-Challenger merger last December. CAB and the possible economies resulting from the merger represented an additional reason for continuing the feeder licenses.

Even so, the three-year extensions proposed for Challenger and Monarch are shorter than the five-year extensions previously proposed for Frontier Air Lines, Southwest Airlines, and West Coast Airlines. One leader, Florida Airways, was put out of business in March, 1949, because of high cost and low traffic.

► **TTA's Struggle**—Another short-line carrier, Trans-Texas Airways, is fighting for its life. CAB last spring ordered the company to show cause why its certificate shouldn't be permitted to expire on May 13, 1950.

Managers in the case were held last month, with company officials arguing that TTA's plane ride costs are the lowest of any DC-7 feeder operator and that traffic is increasing. Officials at Port Office representatives contended that TTA's operations are too expensive to make as a whole. CAB was no likelihood that the short-line carrier will approach commercial self-sufficiency in the foreseeable future. Still, the Board was enough moved by its results to the hope that with some modification and perhaps elimination of "cross country" the line will at the government can be further reduced.

CAB said that both Challenger and Monarch contribute to a lightly-populated area, here have been somewhat less successful than Frontier Southwest, and

West Coast in narrowing the gap between commercial airlines and feeder.

However, Challenger and Monarch serve a region where geographical conditions require airbus interpretation. But create a need for air service. ► **Proposed Route Changes**—As in the case of Frontier, Southwest, and West Coast, CAB has proposed route modifications to strengthen Challenger and Monarch if their certificates are extended.

The revisions would eliminate considerable mileage and save thousands of dollars from the Rocky Mountain feeder network. On the other hand, CAB also allowed a very speedy United Air Lines' stay at Rock Springs and/or Cheyenne, Wyo., for three years to eliminate unnecessary duplication of Challenger's service.

Monarch, whose system covers 1020 route miles and 22 stations, currently requires about \$1,175,000 in mail pay annually. The company began service November, 1946. Last year it had around a 25 percent passenger load factor and flew 30,575 passengers over its various routes.

CAB proposes to eliminate Canon City, Colorado Springs, Leadville, Salida, Grand Lake, Boulder, Colo., and Poudre and Poudre, Utah, from MALL's routes.

In addition, CAB plans to eliminate entirely Monarch's routes link between Denver and Grand Junction, Colo., via Glenwood Springs/Rifle, Craig, Grand Lake and Boulder, Colo.

Merger Argument In Final Stages

The arguments over battle over American Airlines' proposed acquisition of American Overseas Airlines to Pan American Airways for \$17,450,000 came to a close this month as the Civil Aeronautics Board heard arguments in the deal.

Decision is the case is expected this spring, and many observers have predicted that "good policies" as well as "good economics" will figure in the outcome. Because many airlines are involved, CAB's decision is subject to Presidential approval. A CAB agreement has already indicated the merger (American Wire, Jan. 3).

► **Executive Cooperation**—In weighing up its arguments for approval of the NOA sale, American Airlines negotiated that there is too much air service over the North Atlantic. It said that NOA's traffic is going after that Germany has better stock and foreign flag competitive has been increasingly effective.

Prospects that American Overseas will earn a profit in the future are bleak,



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Mathematical Theory of Rocket Flight

2. A comprehensive treatment of the mathematical theory of rocket flight. It covers the theory of rocket motion, including the equations of motion, the theory of rocket propulsion, and the theory of rocket stability. It also covers the theory of rocket control systems. This book is a must for anyone interested in the mathematical theory of rocket flight.

Gas Turbines for Aircraft

3. An extensive introduction to the theory and design of gas turbines for aircraft. It covers the theory of gas turbine operation, including the equations of motion, the theory of gas turbine propulsion, and the theory of gas turbine stability. It also covers the theory of gas turbine control systems. This book is a must for anyone interested in the theory and design of gas turbines for aircraft.



Jet Propulsion Progress

4. A comprehensive treatment of the progress of jet propulsion. It covers the theory of jet propulsion, including the equations of motion, the theory of jet propulsion propulsion, and the theory of jet propulsion stability. It also covers the theory of jet propulsion control systems. This book is a must for anyone interested in the progress of jet propulsion.

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5. A comprehensive treatment of the theory and design of gas turbines and jet engines. It covers the theory of gas turbine operation, including the equations of motion, the theory of gas turbine propulsion, and the theory of gas turbine stability. It also covers the theory of gas turbine control systems. This book is a must for anyone interested in the theory and design of gas turbines and jet engines.

6. A comprehensive treatment of the mathematical theory of rocket flight. It covers the theory of rocket motion, including the equations of motion, the theory of rocket propulsion, and the theory of rocket stability. It also covers the theory of rocket control systems. This book is a must for anyone interested in the mathematical theory of rocket flight.

advisory information but say that they should not detract from the value of OCA equipment in deterring major discrepancies.

It has been suggested that when there is a source conflict in the information furnished by the two systems, such as in the OCA incident, neither source of information should be selected as being more likely correct. Instead, the pilot should use the preflight information which provides the maximum amount of clearance of terrain and obstructions.

Engine Failure Caused Strato-Freight Crash

Went unscheduled engine accident U.S. history, the crash of a Strato-Freight, Inc., C-46 into the ocean near San Juan, P.R., last June 7-8 has been attributed to engine failure shortly after the plane took off with a 1700 lb. overload.

The mishap, claiming death to 52 of the 75 passengers and one of the 28 crewmen aboard, caused a tightening of Puerto Rico's regulations governing aircraft. Because of the crash and serious violations, the Civil Aeronautics Board last November revoked Strato-Freight's operating certificate. Effective Feb. 5, 1950, CAR also ruled for its month the pilot certificate of the C-46's captain, Lee E. Wehrli.

CAR's investigations disclosed that the C-46's right engine began to backfire and lost power a minute after the plane took off from Isla Grande Airport, San Juan, bound for Miami. Carrying a total gross of 49,700 lb. against the 45,000 lb. allowable, the plane lifted in question altitude and crashed in the water six miles from the airport.

Wing Spoolings—At a time of crash, wheels and flaps were in retracted position, but the right wheel flaps were fully open, leading lights were extended, and the right propeller was not feathered—all of which indicated the air speed. Thirty of the 56 spark plugs installed in the right engine were not approved for use but by the manufacturer at the plant, the manufacturer of the engine or by the U.S. Air Force.

CAR said the Pratt & Whitney R-1850-51 engines in the Strato-Freight C-46 had combustion chamber temperatures and pressures too high for satisfactory operation of AC-119B-1 plugs. In this engine, the rear spark plug at the right engine's No. 6 cylinder operated at such a high temperature the counter electrode fused with the outer electrode.

The plug may have reached this temperature as a result of the engine's operation on only the rear set of spark plugs. This was indicated by the post-



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tion of the propeller switch, which was based on the "left" position, and by the fact that the lowest set of plugs showed no evidence of heat, while the next row showed signs of excessive heat. Five thirty-spark plug brackets for the right engine were found to be oily and dirty, and spark plug electrodes had too much clearance. Heavy carbon deposits were found on the compressor discharge valve and the carburetor air intake screen of the right engine—an indication of severe fueling.

The Strato-Freight accident was one of the fatal crashes involving U.S. non-scheduled airline operations last year. A total of eight crewmen and 104 passengers were killed in the mishaps.

WAL Profit Soars

Western Air Lines now that topped its profit in 1949 as compared with 1948. President T. C. Donahoe attributed the gains to higher traffic, expansion, cost reduction program and more efficiency and productivity on the part of employees.

Preliminary unaudited figures show WAL with a \$444,000 net profit after taxes last year, equal to 54 cents a share of contributing stock. The company with \$114,504 profit (26 cents a share) in 1948. The company earned over \$90,000 during fourth quarter 1949.

Western earned 422,193 revenue passengers last year, up 19.4 percent over 1948. Operating performance for 1949 was 97.72 percent.

Discretionary announced election of five new WAL directors, bringing the total to ten. Additions are Hector G. Hight, Los Angeles regional manager of the Reconstruction Finance Corp.; John M. Wilcox, 3322 Lulu City Center, Salford P. Woodbury, Portland, Ore. businessman; Marvin W. Lander, WAL vice president; and Alexander Wadlow, business manager of the Coast Film, Mort, Tribune Leader.

SHORTLINES

At Transport Arm—His joined with the U.S. Chamber of Commerce in requesting complete report of both the 15 percent federal tax on foreign income and the 3 percent tax on flight ATA debt that reduction of the tax savings for from 15 to 10 percent (as recommended by the Treasury Dept.) would equalize the tax benefit effect on the airlines, while full repeal of the law would increase the current passenger revenue by \$20 million annually and cut out pay needs. The Treasury Dept. complete report of the flight



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STRICTLY PERSONAL

OLD TIMER DEPARTMENT—While L. Nye of San Lucas, Calif., awaits his court call for some 2000 stolen numbers old timers. Early on Henry F. Nye, 65, 1000 S. 10th Ave. at 378 13th St., San Lucas, Calif., says, "My old fellows evened outly but I was supposed to be out for the past 30 years. I was with my brother Nils who was killed in 1909 to the death at Anderson City, Calif. Henry reentered during World War I at a civilian school at San Carlos and was active till 1920 in that business. He had two other brothers who were killed."

HOW WAS THAT AGAIN? There was a brand new heater on the U.S. flight to Youngstown on the morning of Feb. 15 who could converse with men's English in Coon's dialect. At one stop she came out of the pilots' compartment calling back over her shoulder, "You fellows run me one in a million." We're still trying to figure that out. At Youngstown, as we recall, we were the only passenger getting off. As we were struggling to get a coat out of the rack above, Coon stood stoically at the open door, leered broadly, and called out at her station voice in an Irish brogue, "You had better be getting out of here fast. It's comin' in the St. Patrick's Day!"

THE COCKPIT'S WAITING ZEPHYRUS—And speaking of *Heaven Without* Sherburn, our favorite American Airlines pilot philosopher, he tells us about a dizzy young passenger who waited at front of an intermediate stop. The first officer was asking out none of those wounding forms. "Oh, I think it's a simply marvelous," he probed, "depending your days, flying around the swirling day and the birdland of clouds." To which the first officer grunted, without looking up. "Yeah, but the truth is the captain smells a little game."

VON FLUGEN'S REPERCUSSIONS—Three ancient writs of copyrighting double it. Her *Daliole E A Von Flug*, a no day. After we published his scathing piece on "The Effects of Cystall Oscillatory Mobion," the doctor ad dead put the left on our correspondence, and named his another writ's standing with it. Because there is one principle of ascertaining constancy in which we stand. We never allow the text of late to become associated with contributions to the column. You do it for me, for the sheet got of going and of being so much more than a mere article. I am not at all surprised that you have said: "I see you published my article. Ah, I told to some of my subscription to your very last publication [New, under, this obviously a flattery with an alternate issue, as you will see if you read further—Ed. Note] and have been receiving graphic reminders at the rate of one per hour since my previous last export. Now, I feel that such a noteworthy state filler as my article is at least worthy of a free copy of the issue in which it appeared, and is probably worth an honorary add-on to the next issue." I am not at all surprised that you have said: "Incidentally we are not certain whether the extra copies of the *Polymerization*

HOFFWITZER IS HUPSET—On the stationery of Anichovich Inc., at Caldwell, N.J., comes a letter plant from **J. M. A. Hoffwitzer**, who was mentioned in a footnote to Von Flammen's paper. Says he, "First of all correct spellings please. It is **HOFFWITZER**, pronounced as spelled, with the Z silent. More mildly, for I never permit myself to gett^habesitive, I wish to clarify a few points brought out in subject's memo."

[71] Apparently, some confusion concerns relative importance, & not indeed the understanding of the great difference between concrete and rebar and rebar tracks. CONcrete rebar tracks are those made by the bearing rebar(s) above its own steel mass while rolling along the ground. I mean, of course, the ground rebar surface. REbar tracks are, at any rate readily comprehended, the opposite effect. REbar rebar(s) are, then, comparable as between

And from aviation writer Ed Rossini comes a note scrawled on the clipping of "The Effects of Orbital Oscillatory Motions." Note says "It has the best you could do while on your locomotion in Bermuda!" Finally, Rossini, yes.

REPLY

WHAT'S NEW

New Books

"Design Manual on Aircraft Electrical Installations" is the second in a series of manuals by the aeronautical requirements committee on electrical installations of the Aircraft Industries Assn.

Based on practical experience and design knowledge of leading industrial engineers, assisted by USAF, Navy, and CAA electrical specialists, the manual broadly covers transport aircraft, but most of its features are equally applicable to military and other types of civil aircraft.

The 16 chapters treat current protection, circuits for essential equipment, cable selection and coating; electrical equipment selection and installation, maintenance, operation, and inspection, electrical system tests, etc.

Copies of the manual may be obtained from The Aircraft Industries Assn., 610 Sherman Bldg., Washington, D. C., price \$1.75.

"The Theory and Design of Gas Turbines and Jet Engines" by E. T. Vincent, professor of mechanical engineering, University of Michigan, covers the theory of gas turbines and practical applications of that theory to specific design problems.

Parameters affecting performance characteristics are considered and potential limitations imposed on these parameters by design, outreach, etc., are investigated. Limitations imposed on the flow type of combustion process have been developed, as well as some of the conditions governing development of shock, choking, etc.

A number of worked-out problems are included typical of those to be encountered in actual practice, as well as a number of problems for student solution.

Published by McGraw-Hill Book
Co., Inc., 120 W. 42 St., New York
16, N. Y. 606 pages, price \$7.95

"The Aircraft Year Book for 1949," 11st edition, official publication of the Aircraft Industries Assn., is aviation's traditional encyclopedia. This edition contains photos and three-views of over 100 U.S. planes, thousands of long-nosed 1950 contemporary aviation personalities, aviation record listings, etc.

Major portions of the test is taken up by extracts from the reports of President Truman's Air Policy Commission (the Follett Commission).

Published by The Lincoln Press,
Warner Bldg., Washington 4, D. C.,
464 pages, price \$6.00

ADVERTISERS IN THIS ISSUE
AVIATION WEEK—MARCH 11, 1956

[illegible]

each step is critical!



During a half century of precision gear manufacture IGW has developed unique skills and techniques in the production of intricate gear of highest accuracy.



This fuel pump room for the Cessna high speed diesel engine must be made breathe up within 0.001" on the cam profile and elsewhere, and it must be sized within limits.



P & W Comes Back—Strong

The spectacular announcement the other day of Pratt & Whitney Aircraft's big, new J-45 turbojet power plant took the headlines.

Disembodied were two other aspects of the achievement. That Pratt & Whitney reveals the most powerful jet engine now flying in this country only four years after the dream was dreamed whether the future held anything for it at all. And that this was accomplished with wholly owned facilities.

Not one part of the new \$12-million turbine laboratory, named after Andrew Dean Wilson, the division's chief engineer for 21 years, belongs to United States. It is the largest privately owned jet research facility in the world.

Pratt & Whitney's general manager, William F. Green, presented someone at the other end of the day that all of the division's facilities—back and motor and machinery—are privately owned by United Aircraft Corp.'s 16,000 stockholders. "I know it will interest you to learn that we are the only aircraft engine manufacturer in this country who is not operating with government-owned facilities," he said.

Did this independence do things up? Hardly.

At war's end P&W didn't see a sign of any turbojet countries abroad. It had a few production orders for R-2800 and R-4350 piston engines, and that was all the military business as the back. The decision was made to turn with Radio-Boeing to catch up on the drive to develop a four-cylinder General Electric and Allison were enjoying as a result of similar work with the British's Westinghouse that was in the picture with its own design. Simultaneously, P&W began its own gas turbine development program, aimed at goals surpassing what would be available through Radio-Boeing.

From the time Bell Canada came back in 1947 with the Nine blueprint, to the successful flight testing of the J-45 in about two and a half years. Meanwhile the Nine was converted to U. S. Navy standards, production of the J-45 has been underway for a year, and the J-45 is flying.

And P&W's own operating design, subject of much current industry comment—a big turbojet and a gas turbine—were now fighting it out with Allison, General Electric and Westinghouse for their place in the next generation of military planes after the P-53, P-54 and P-55 series.

Pratt & Whitney must be proud of its comeback. This is a lot of work in 1947 when P&W wondered whether the future held anything for it.

Time to Live

Continental Air Lines has launched an aggressive campaign of public speaking by all of its traffic and sales managers in 25 cities under the direction of William Ambler, public relations director.

One of the talks, made by Robert Simonson, CAL's traffic chief at Wichita, discusses water circulation. Titled, "Time to Live," it strikes home at first.

"The company, through connection with a vast network of airlines, brings me speed in travel, and that gives me time to live," Simonson first tells his listeners at a club or roomer's club somewhere along CAL's route.

"First, though, you must be willing to take advantage of what the airline industry can do for you in the matter of getting time to live. Continental serves you very well, as do all the people here who use the service provided. Having something is of little value unless it is used."

"My experience as this business, from actually flying airplanes to selling the service on offer, has taught me that most people who do not fly are not willing to because they are afraid. Very frankly, they are afraid of dying. Who isn't? Since time is our most precious possession, none of us wants to give up too early. . . . we say."

"Yet, ladies and gentlemen, all too few of them take individual risks that, instead of shortening their lives, air transportation can lengthen them, in reality, by saving time . . . the stuff of which life is made. Travel by air gives people time to live."

"Wards are cheap, you might say. It's facts we want. Well, consider these facts."

"(1) Air travel is 23 times safer than traveling in your own auto. (2) A person can fly one million miles a year for 100 years before making a fatal airline accident. That would mean, at the average cruising speed of 350 miles an hour, he would fly 208 days and nights each year for 168 years. Or, a person could aboard a commercial airliner and bring constantly for the rest of his life, would have a life expectancy of 57 years. (3) The insurance companies, with all their vast knowledge and statistics on risk, charge no more for airline trip insurance than for all other airline transportation."

"For example, an airline passenger may purchase trip insurance at a rate of only 23 cents for each \$5000 coverage, to a maximum of \$15,000 for \$1.25. Assuming each passenger as one of our General Electric purchased a \$5000 policy, it would make a total insurance coverage of that flight of one million dollars. The entire premium would be only \$15. In effect, then, the insurance company would be bettering one million dollars against 23 cents that it would not be called upon to pay except in a situation. The insurance company will make the same deal not just one way, but on a round trip basis, as well, effective for 30 days, and at an extra charge."

Naturally, Simonson and other CAL speakers do not fail to refer to Continental's record of having flown more than 900 million passengers safer in over 15 years without a passenger fatality.

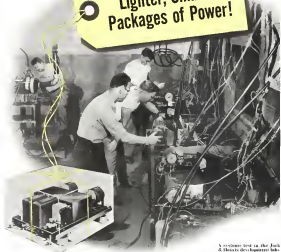
The speech then develops the time saving theme. "You spend your time thus, instead of in haste. Any place in the world is only as far away as the time it takes to fly there. Distance is no longer measured in miles but in time."

When you save time in traveling between two points, you are gaining time to live. The doctor has lengthened your life through medical science, the scientist through shortening the distance between where you are and where you want to be. The air is your aid. Use it to get time to live."

One "intending" revelation of the speech program, writes Stewart Faulkner, CAL's publicity chief, "is that the audience usually seems so interested in learning of airline accomplishments of better service as they are of safety statistics. CAL is considering a major revision of all rates and advertising themes, to do more positive selling and to drop the apparent negative emphasis."

Robert H. Wood

MEN AT WORK ON Lighter, Smaller Packages of Power!



A systems test in the Jack & Heintz development laboratory. Typical systems and control panel.



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FOR COMMERCIAL AIR LINES



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DOUGLAS DC-6



McDONNELL BANSHEE



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